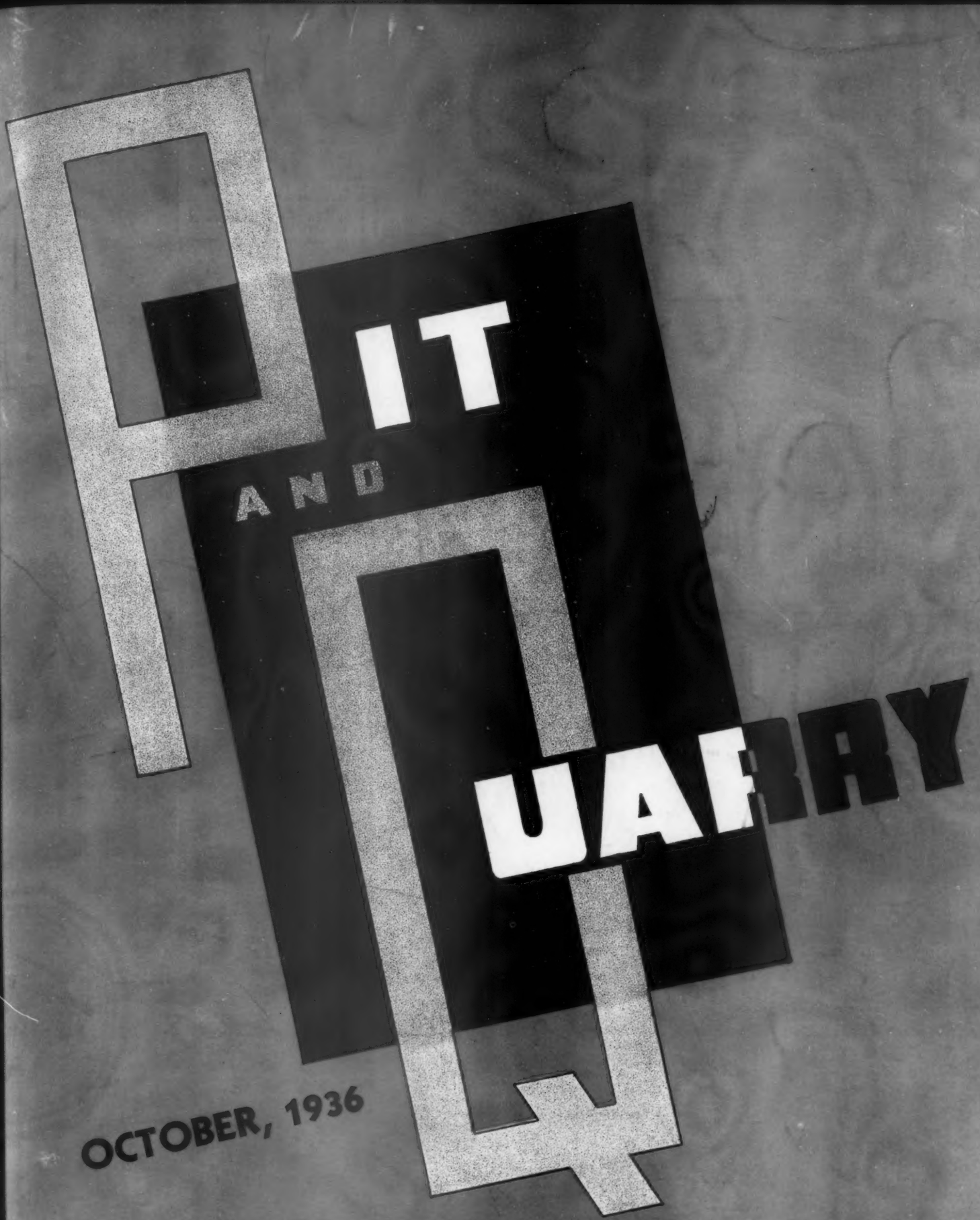


OCTOBER, 1936

Canada Cement Rebuilds Belleville Plant . . . Depreciation and Obsolescence . . . The Probable Economic Effect of the Robinson-Patman Act . . . Consolidated Feldspar Completes Improvements at Erwin, Tenn.

NO JOB FOR AMATEURS — building large-diameter sections of Goodyear Hose — no matter in what type of service the hose is to be used — requires the highest type of hose-building art.

WHERE SKILL IS IMPORTANT — building large hose requires expert craftsmanship, from the tube to the cover of the hose. These veteran craftsmen are applying flat steel wire employed in certain types of rough-bore hose.

THE ONE THING NO PRICE LIST SHOWS

counts most in buying large industrial hose

THERE is something far more important than price or even specifications that you should investigate, if you use hose for dredging, sand suction, oil well rotary drilling, or the loading or fueling of ships with oil.

It is something no draftsman can blueprint, no cost accountant can figure. It is the skill and knowledge and craftsmanship of the men who build this huge hose that must be built by hand.

The cornerstone of quality

Here at Goodyear, the youngest in our Number One Crew of seven men who build these rubber monsters, layer by layer, is a mere babe who has been making hose for only 22 years! The experience of the seven totals 191 years — an average of more than 27 years per man!

Year by year for more than a quarter-century, these men have been acquiring the knack and "know how" and teamwork that comes with long practice. Their inimitable skill is the very corner-stone of quality — the priceless ingredient that fuses good engineering and good materials into good hose.

Job-fitted by the GTM

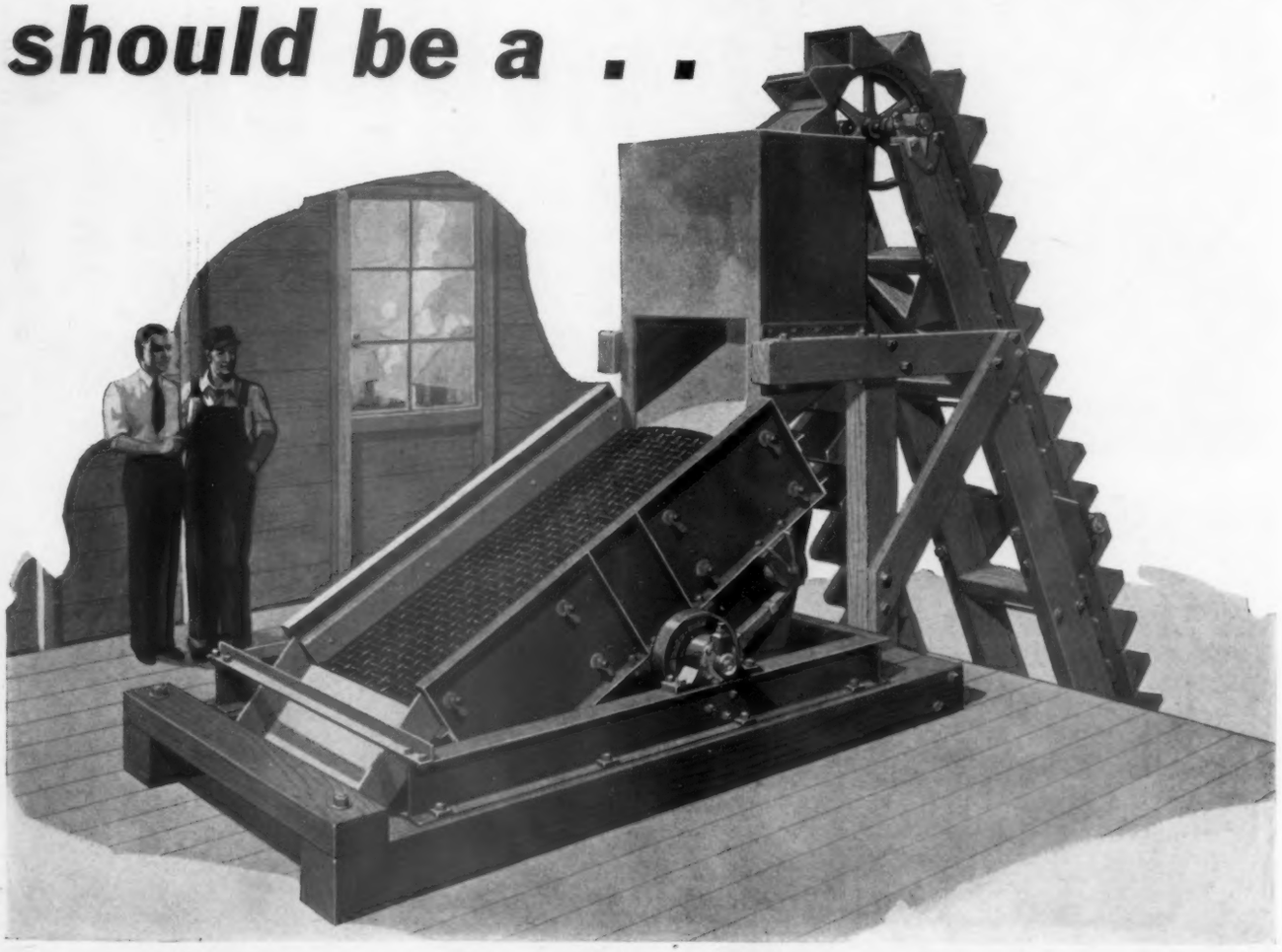
That is why you find Goodyear Hose on all types of jobs the world over — because experience proves its superior construction makes for far longer service at far less cost. And economy is further assured by the fact that Goodyear Hose is individually specified to each job on careful analysis by the G. T. M.— Goodyear Technical Man. This practical authority will gladly consult with you on your special hose requirements. Just write Goodyear, Akron, Ohio, or Los Angeles, California — or the nearest Mechanical Rubber Goods Distributor.

BELTS
MOLDED GOODS
HOSE
PACKING
Made by the makers of Goodyear Tires

OUR CREED — to build only products worthy of THE GREATEST NAME IN RUBBER

PIT AND QUARRY, October, 1936, Vol. 29, No. 4. Published monthly by the Complete Service Publishing Company, 538 South Clark Street, Chicago, Ill. Subscription price: $2 for 3 years, $1 for 1 year in the U. S. and possessions, Canada, and Central and South America; elsewhere $1 additional for each year. Single copies 20 cents. Entered as second-class matter November 28, 1932, at the Post-Office at Chicago, Ill., under the Act of March 3, 1879.

Your Next Vibrating Screen should be a . .



LINK-BELT

Because:

1. Mechanically operated with few moving parts, resulting in low operating and maintenance costs.

2. No dead screening areas. Method of imparting uniform intensity of vibration results in maximum efficiency, capacity and long life.

3. The screen cloth is entirely unobstructed, permitting free passage of material. Especially well adapted for the application of water sprays when washing, because of the uniform beds of material running down at a steady rate.

4. Angle of incline of screen can be readily changed to suit conditions.

5. Long leaf spring assemblies maintain angle of incline, absorb shock loads and prevent side sway while conforming to circular motion of vibrator.

6. Only the screen cloth needs to be removed when cloth replacements are necessary. Simple and easy.

7. All bearings are exact duplicates, and are of the self-aligning roller type, enclosed in dust-proof housings.

There are two general types of Link-Belt Vibrating Screens: (1) the "UP" unbalanced-pulley type, which is furnished without mechanism for changing the screen angle in service; (2) the "PD" heavy-duty positive-drive type, which is regularly supplied with screen - angle - changing mechanism.

58-9

Send for this new book No. 1562. Address Link-Belt Company, Philadelphia, Chicago, Indianapolis, Atlanta, San Francisco, or any of our offices located in principal cities.

THE SYMBOL OF QUALITY
L-B
LINK-BELT

What's BACK of the DIPPER?

Visitors in the pit or quarry and the operating executives as well are always interested in the working of a power shovel. The performance of the power shovel is fascinating to the onlooker . . . to the operating executive it means cold cash. Both are interested in one question: "What's back of the dipper?"

As far as Diesel Shovels are concerned, the usual answer to that question is "Atlas Diesel," for there are today more excavators powered with Atlas Diesels than with the engines of all other Diesel manufacturers combined. Atlas Diesels pioneered the excavating field. They provided just what producers wanted . . . equipment built to withstand a beating . . . engines that would move maximum yardage at the lowest possible cost.

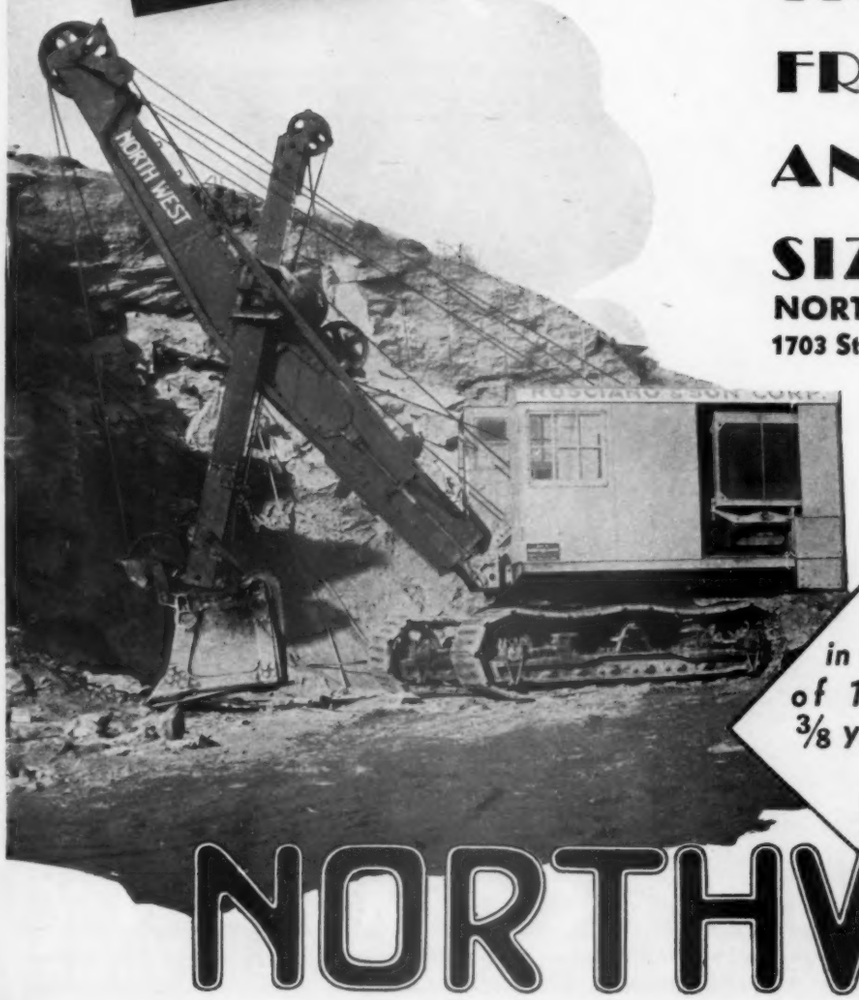
That is exactly what they found in Atlas Diesels, and that's why most of the Diesel powered shovels have Atlas engines today. The dirt moving and operating cost records of hundreds of these Atlas Diesels maintain the Atlas leadership in the powering of shovels, draglines, locomotive cranes and locomotives. When you buy a Diesel powered excavator, be sure it is powered with an engine that has proved that it can "take it."

Atlas Diesels of the Industrial Type shown at the left are heavy duty machines operating at medium speeds. They are fully enclosed and dustproof, available in 3, 4, 6, and 8 cylinder models in the following range of sizes: 45, 60, 80, 90, 120, 140, 150, 165, 200, 275 H. P.

ATLAS IMPERIAL DIESEL ENGINE CO.
Oakland, California ::: Mattoon, Illinois

ATLAS IMPERIAL

NO NORTHWEST *Welded* SHOVEL BOOM HAS EVER FAILED!



THE HUSKIEST FRONT END ON ANY SHOVEL— SIZE FOR SIZE

NORTHWEST ENGINEERING CO.
1703 Steger Bldg. 28 E. Jackson Blvd.
Chicago, Illinois

GASOLINE • ELECTRIC • DIESEL • OIL

Built in a range of 15 SIZES 3/8 yd. capacity and Larger

NORTHWEST

The Koehring Wheel Dumptor
for hauling · dumping · spreading

Full vision for the Koehring Dumptor operator means fast loading, quick getaway, spot dumping and spreading. He has complete eye control of all operations from the driving position . . . the load is always ahead of the operator . . . for quick and easy spotting at the loading unit and instantaneous dumping . . . *seconds saved* in every operation by eliminating all unnecessary moves.

KOEHRING HEAVY DUTY

FULL VISION for SPEED

The load is instantaneously dumped by force of gravity, without time-losing mechanical complications.

KOEHRING COMPANY

Pavers · Mixers · Shovels · Cranes · Draglines · Dumptors · Mud-Jacks

3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN

BIG PROFIT COMBINATION

YOUR SAND—THIS MACHINE

Multiple sizes make DUNBRIK and DUNSTONE the most flexible masonry material.

←THIS BRICK

TESTED OVER 90,000 POUNDS

Its Absorption Less than 6%

ITS COST

$5.00 per 1000

COST BASIS FROM AN OPERATING PLANT

1.4 Cu. Yds. Aggregate	$1.68
1 Bbl. Cement	2.20
Labor at 50c per hour	1.07
	$4.95

Men of foresight in the aggregate industry are now cashing in on the rapidly increasing demand for permanent building material. Consolidated Rock Products Co., Brooksville, Fla.—F. A. Rider Sand & Gravel Co., Vestal, N. Y.—Riverside Sand & Gravel Co., Thiensville, Wis.—Alabama Ice and Utilities Co., Montgomery, Ala.—Consolidated Quarries of Georgia—Georgia Mineral Products Co., Tate, Ga.—Bayer-Brice Co., Flint, Mich.—are some of the producers that are profitably converting their surplus or waste aggregate into DUNBRIK and DUNSTONE—a superior trademarked building material.

Today's building market demands lower cost in permanent, colorful construction. With your aggregate and the automatic DUNBRIK Machine, you can produce a superior brick and DUNSTONE in both common and faced units that permit hollow wall and ashlar types of construction at cost level of frame.

We equip you with new and revolutionary line production machinery, permitting large production with only one or two men. Equipment costs but a fraction of what would be required for other processes of equal capacity.

Here is the outstanding opportunity for you in your locality. Why not investigate now. It will cost you nothing and may mean many thousands of dollars to you. Write today. It tells the whole story.

W. E. Dunn Mfg. Co.,
420 W. 24th St.,
Holland, Mich.

Please send your book "4 Keys to Manufacturing Success," outlining this timely opportunity for aggregate producers.

Name .....

Address .....

City & State.....

REPUBLIC

Conveyor BELTS

. . . KEEP QUARRY OPERATING COSTS AT A MINIMUM

● Our field engineers are conscientious in their efforts to make every application of Republic Conveyor or Elevator Belting a means of reducing operating costs. This necessitates that each installation be looked upon as a new and individual problem. Engineering knowledge, as applied to quarry and sand pit operations, has constantly increased and today's standards of efficiency are higher than those of several years past.

Conveyor and elevator belt quality must always be judged from the standpoint of the work to be performed. The belt must fit the job with relation to maximum capacity, size and character of material, and many other factors which dictate the type of construction required. Republic manufactures several grades and you may refer to the nation's largest aggregates producers for proven evidence of their economy and long endurance on carefully planned operations.

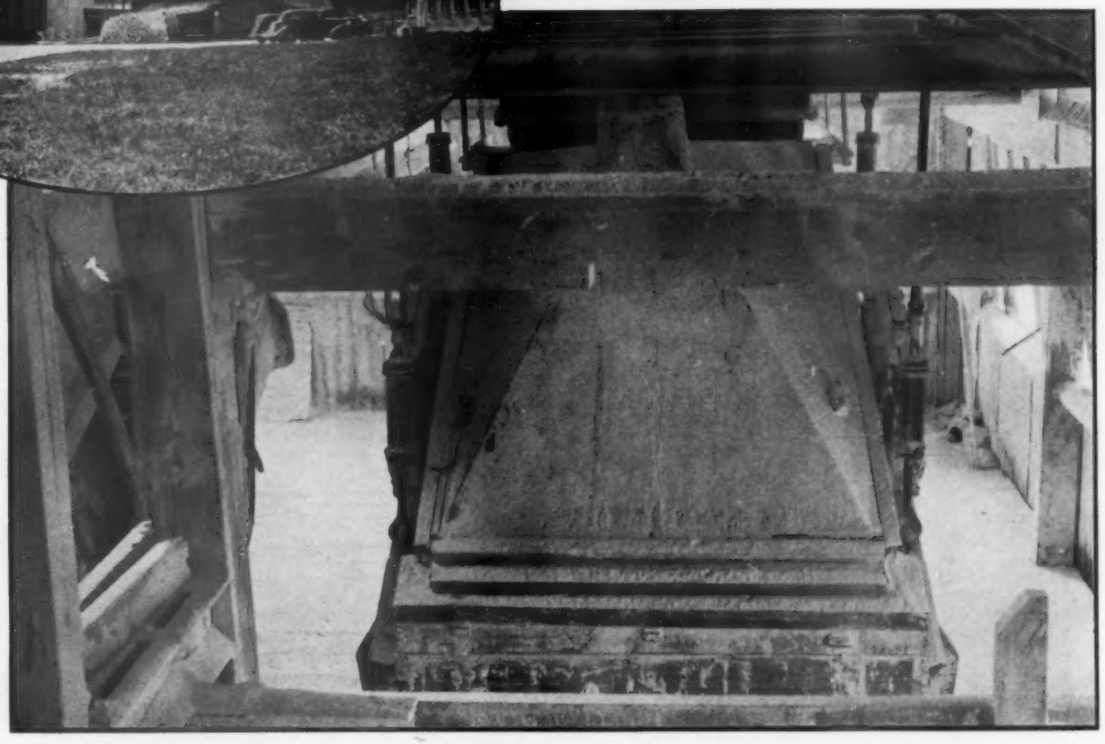
THE REPUBLIC RUBBER CO. «» YOUNGSTOWN, OHIO

MECHANICAL RUBBER PRODUCTS FOR EVERY INDUSTRIAL REQUIREMENT

ORDER REPUBLIC RUBBER PRODUCTS FROM YOUR DISTRIBUTOR

LEADING FELDSPAR COMPANY

Chooses Jeffrey-Traylor Electric Vibrating EQUIPMENT



The rebuilt and completely modernized plant of the Consolidated Feldspar Corp. in Erwin, Tennessee, is shown above. At the right and below are shown two of the three totally enclosed J-T Electric Vibrating Screens.

Jeffrey-Traylor Equipment needed little introduction at the modernized Erwin, Tennessee, plant of the Consolidated Feldspar Corporation. Satisfactory and profitable performance of J-T Ball Mill Feeders and Spreader Feeders in operation in other plants of this large company served as suitable recommendation for the recent installation of J-T Electric Vibrating Screens at the Erwin plant.

That's true of J-T Equipment . . . wherever correct sizing, quality control and intricate feeding are rigid requirements . . . you'll find that its efficiency speaks for itself. Once a user of J-T Electric Vibrating Units . . . Feeders, Screens, Conveyors and Constant Weight Feeders . . . always a user. You can't very well modernize without them.

Experience over a long period of years in handling all kinds of materials through a multitude of operations enables Jeffrey to offer a distinctive service in equipment and engineering skill. You'll find it profitable to discuss with Jeffrey Engineers the best way to handle your material.

A diversified line . . . a broad service.

Jeffrey-Traylor Division

THE JEFFREY MANUFACTURING COMPANY

917-99 North Fourth Street - Columbus, Ohio

APPROVED

Wherever "Form-Set" Purple Strand Wire Rope has been used it has been accepted with utmost praise.

For use wherever it's "TOUGH GOING"

You, too, will appreciate this, the utmost in Wire Rope Quality when you once use it.

It is tough, made from the most durable, fatigue resisting wire of most minute accuracy in the sizing and close fitting of wires.

Will you tell us what you would like to use this rope for and let our engineering department specify the most suitable construction, and send you our latest catalog?

WILLIAMSPORT WIRE ROPE CO.

Williamsport, Pa. — *Other Offices in All Principal Cities* — 122 So. Michigan Ave., Chicago, Ill.

IT'S SAFER

TO SPECIFY HEWITT"

In every industry, without exception, there are production managers, plant operators and purchasing agents who insist there is no boundary to the superfine performance of HEWITT transmission belts. Year in and year out they stick to HEWITT and always get a larger measure of service than even they expect. Any one of them will tell you "It's safer to specify HEWITT". Whatever your requirements may be, whatever is the service to which your belting is put, there is a brand of HEWITT made especially for the job. A HEWITT distributor will describe an imposing array of features —talk it over with him. You will find him listed in the classified telephone directories of major industrial centers under "Rubber Goods" or "Belting". HEWITT distributors also have a new idea in purchasing industrial rubber goods—the HEWITT Proof Test Plan.

HEWITT

RUBBER CORPORATION

BUFFALO, NEW YORK

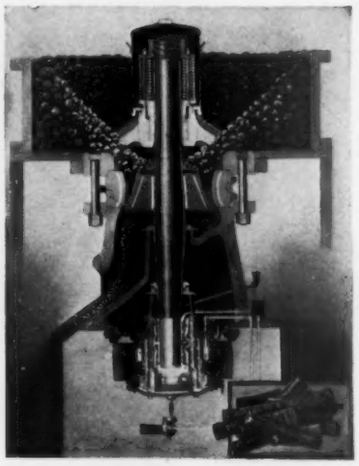
HOSE • CONVEYOR AND TRANSMISSION BELTS • PACKING

IN BINDING

Operating figures prove the economy of these Power Savers

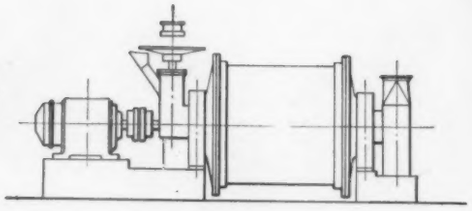
Kennedy Crushers and Screens are showing spectacular results in the production of aggregates under the hardest working conditions, in some cases doubling capacity and reducing power costs by half. The performance of this Ball Bearing Gearless Gyratory Crusher, for example, is attracting the attention of producers throughout the world. Comparative figures show actual savings of 50% in power consumption and 80% in maintenance cost.

Ask for details of this super-crushing unit.



Kennedy Ball Bearing Gearless Gyratory Crusher

Kennedy Gearless Tube Mill



Highly efficient for grinding limestone, minerals and similar materials, also for pulverizing coal in firing kilns and boilers. Details sent on request.

Kennedy Vibrating Screen

Does great work in scalping oversize from primary crushers, also in grading smaller sizes. Built in open or enclosed type in widths of 18" to 72" and with one or more decks, for suspension or bottom support.

KENNEDY - VAN SAUN MFG. & ENG. CORP.

2 Park Avenue New York, N. Y.

Sales Agents in all Principal Cities of the United States

LIMA USES SPECIAL STEELS SUITED TO THE WORK THE PARTS ARE TO PERFORM

LIMA

ALLOYS used in the manufacture of LIMA excavators have been especially developed for the work the parts are to perform. Rigid tests, both physically and chemically, are made to ascertain that the steels are properly annealed and heat-treated. These tests are made in LIMA'S own up-to-the-minute laboratory, under expert supervision of men who are responsible for the steels that go into the manufacture of Lima Locomotives. This highly important feature is but one of the many precautions taken by LIMA to assure the customer that he is getting a machine that will withstand the most severe service with only the minimum delay.

CARBON STEEL CASTINGS

1 Used where maximum strength combined with ability to withstand torsional and shock loads is required, such as truck base and revolving base castings.

CARBON STEEL FORGINGS

2 Used where bulldog resistance to bending under heavy loads is required, such as axles.

CHROMIUM NICKEL HEAT-TREATED STEELS

3 Used where shock loads combined with severe torsional and bending stresses are encountered, such as machinery shafts.

LIMA LOCOMOTIVE WORKS, INCORPORATED

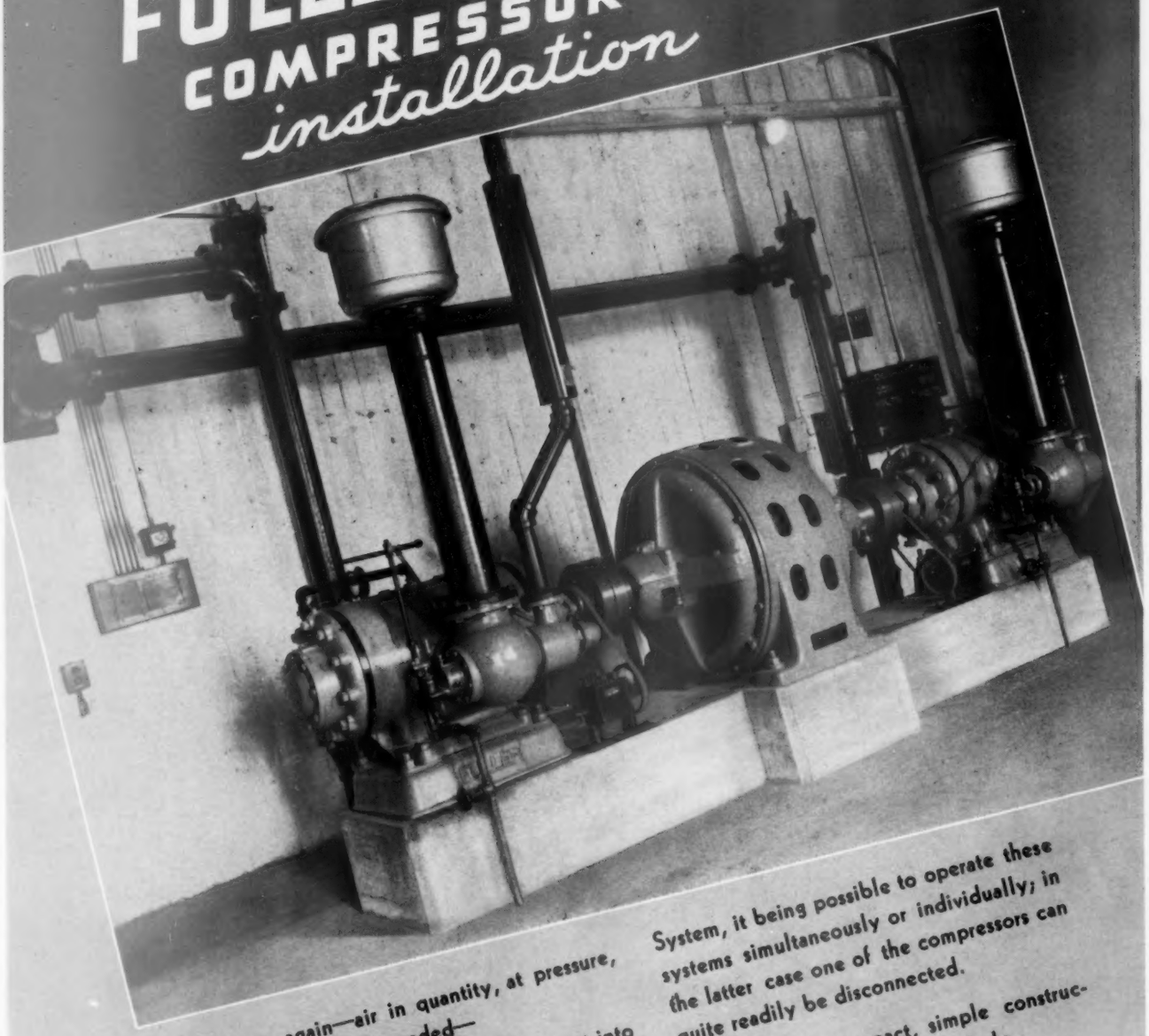
SHOVEL and CRANE DIVISION — LIMA, OHIO, U. S. A.

NEW YORK, 167th St. & Sedgwick Ave.
CHICAGO, 1543 Stock Bldg.
NEWARK, N. J., 217 Frelinghuysen Ave.
SEATTLE, 4422 First Ave. So.
DALLAS, 1304 McKinney Ave.
The General Supply Co. of Canada, Ltd., Ottawa, Ont.
MEMPHIS, 77 McCall Street
Tree Machinery Company, Ltd., Vancouver, B. C.

LIMA

SHOVELS — DRAGLINES — CRANES — CLAMSHELLS

Another FULLER ROTARY COMPRESSOR installation



Once again—air in quantity, at pressure, when and where needed—

An installation just recently put into service in an Eastern cement plant, comprising two Fuller Rotary Single-stage Compressors driven by a common motor.

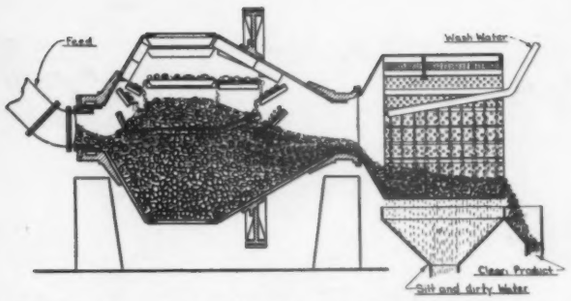
Each compressor serves one separate and distinct Fuller-Kinyon Conveying System, it being possible to operate these systems simultaneously or individually; in the latter case one of the compressors can quite readily be disconnected.

Note the compact, simple construction of the installation as a whole.

Air—When, where, and as you need it.

FULLER COMPANY
CATASAUQUA, PENNA.
Chicago: 1118 Marquette Bldg.
San Francisco: 320-321 Chancery Bldg.

FULLER-KINYON, FLUXO, AND AIRVEYOR CONVEYING SYSTEMS · · · · ROTARY FEEDERS AND DISCHARGE GATES
ROTARY AIR COMPRESSORS AND VACUUM PUMPS · · · AUTOMATIC BATCH WEIGHERS · · · BIN SIGNALS



The Hardinge Conical Scrubber and Rinsing Trommel—Note the Great Depth of the Mass.

The WHY of the CONES *of the* Hardinge Conical Scrubber

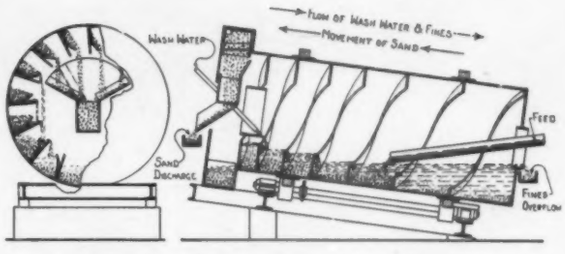
The **Cones** raise the level of material and bring the center of the mass to the largest diameter, away from the feed and discharge openings during rotation—see cut above—this gives greater mass weight and consequent disintegration of soft material. This also permits larger trunnion openings.

The **Cones** give a marked agitation of the mass, producing an intensive scrubbing action of harder particles against softer—this rubs clay balls to slime.

The **Cones,** which permit large trunnions, make it possible to use high shell speed—there are hundreds of more contacts of one particle against the other than is the case with cylindrical drums, trommel screens, logs, etc.

The **Cones** discharge the scrubbed product, without lifters—cutting power and reducing maintenance to a minimum. The Conical Scrubber will empty itself in a few minutes' operation without feed.

Write for Bulletin No. 37



The Hardinge Counter-Current Classifier or Washer Showing Spiral Integral with the Rotating Drum.

The **Integral Spiral** being attached to and rotating with the drum, rolls the material—does not scrape it—this eliminates dead corners, subjects all particles to constant contacts with counter current action of water, and practically eliminates wear.

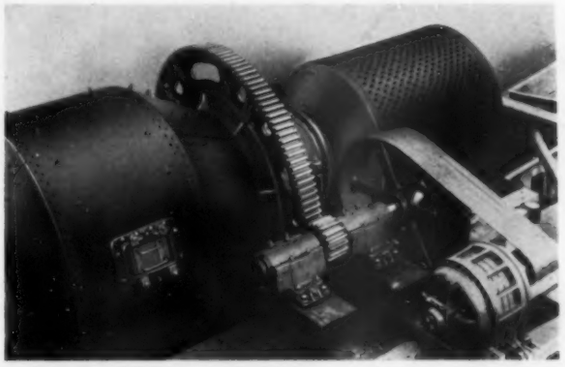
The **Integral Spiral** permits starting under full load—it does not have to scrape through the dead mass.

The **Integral Spiral** produces little or no agitation and thus does not upset natural classification and washing.

Write for Bulletin No. 39A.

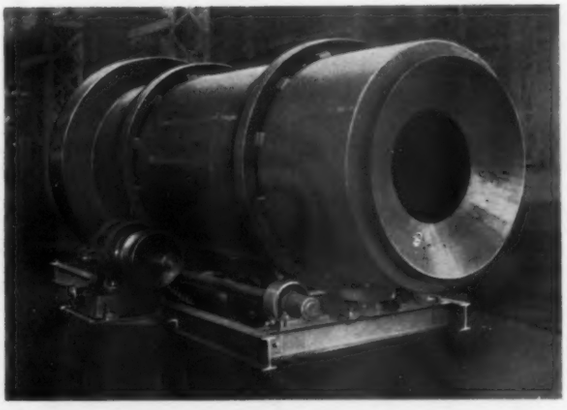
HARDINGE COMPANY
INCORPORATED

YORK, PENNA.—Main Office & Works
NEW YORK—122 E. 42nd St. CHICAGO—205 W. Wacker Drive



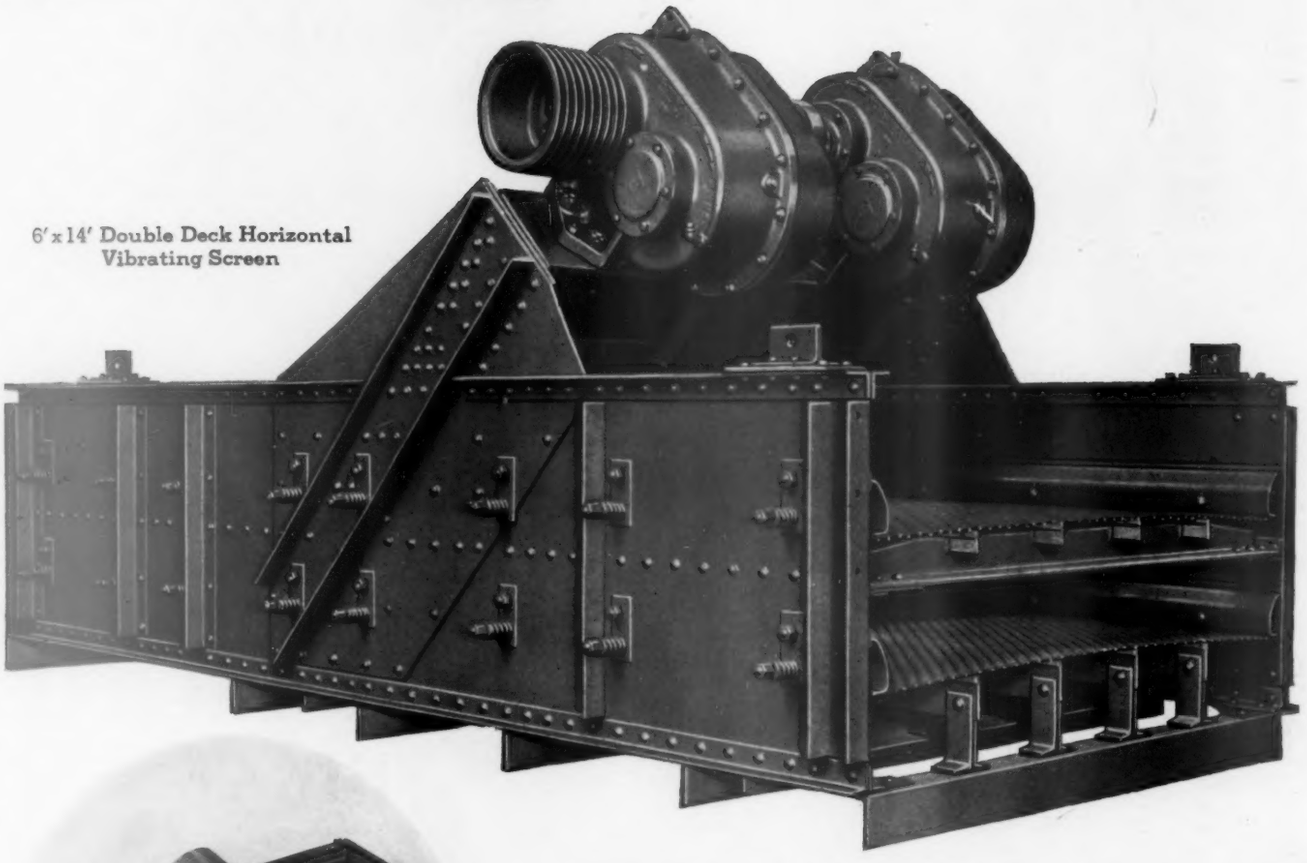
Installation View of Conical Scrubber Eliminating Soft Stone from Gravel and Rubbing Clay to Slime.

The WHY of the INTEGRAL SPIRAL of the Hardinge Counter-Current Classifier and Washer



The Counter-Current Classifier or Washer Used for Classifying or Cleaning Sand, etc.

Low Headroom - Large Tonnages



6′x14′ Double Deck Horizontal Vibrating Screen

1′x2′6″ Horizontal Screen

THE NEW Allis-Chalmers Low-Head vibrating screen is filling a definite need in many plants. Its minimum space requirements enable it to be installed in places that would accommodate no other type of screen. Very little change in plant layout is needed.

Not only are Low-Head screens easy to install but they handle large tonnages with high screening efficiency and low power consumption. They are built in sizes ranging from 3′x6′ to 6′x14′, single, double or triple decks.

Write for Bulletin 1478.

CRUSHING AND CEMENT DIVISION

ALLIS•CHALMERS

MILWAUKEE WISCONSIN

HERE'S A PEEK

at the New 5/8-yard

BUCYRUS-ERIE

TO BE ANNOUNCED *Soon!*

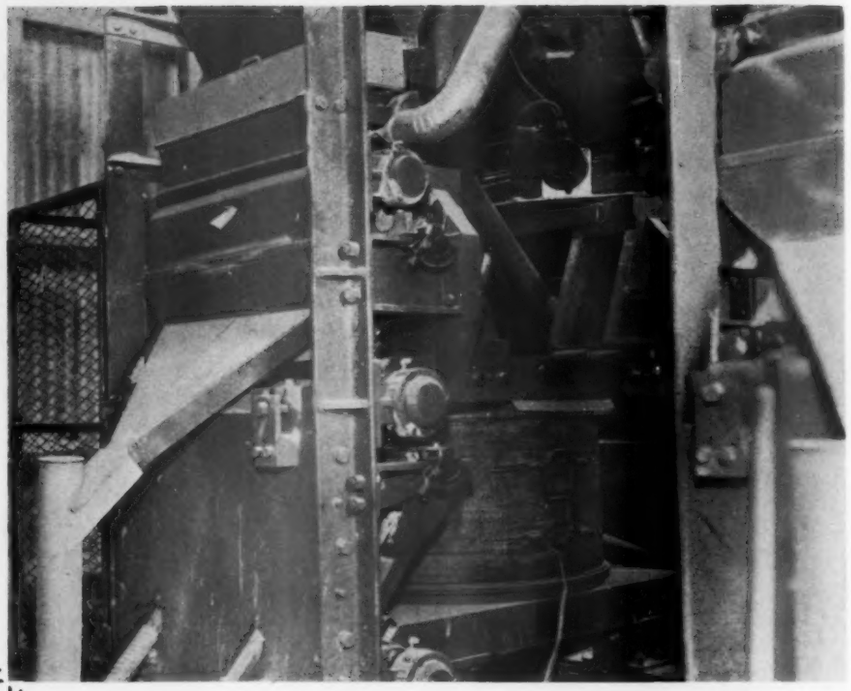
Watch for it!!

BUCYRUS ERIE

402

This EXOLON *Separator*

At right—Unretouched photograph showing one of a battery of four Exolon Separators installed in modern plant of Consolidated Feld par Corporation at Erwin, Tenn. Handles 10 to 20 mesh material, reducing the iron content from .08 per cent to between .05 and .06 per cent, also removing small amounts of mica, garnet and tourmaline.



THESE PRODUCTS
. . . *and many others* . . .
HAVE BEEN SUCCESSFULLY PURIFIED AND CONCENTRATED BY

EXOLON
Super-Separation

FELDSPAR
APATITE
KYANITE
MANGANESE
DOLOMITE
BORAX
GYPSUM
ILMENITE
GLASS SAND
SILICA
BAUXITE
RUTILE
GARNET
MICA
NEPHELINE-SYENITE
CLAYS
MAGNESITE

installed in the plant of Consolidated Feldspar Corporation at Erwin, Tennessee,

Increases Yields of Saleable Product

Provides Precision Control of Quality

Is Simple to Operate; Economical to Run.

The answer to YOUR concentration and purification problems may likewise be found in Exolon High Intensity Magnetic Separator equipment. If ordinary methods of magnetic, mechanical or chemical separation have not provided the solution, all the more reason why Exolon Super-Separation should be considered. Write for Bulletin K-3, giving complete details of tests and specifications of equipment.

THE EXOLON COMPANY, BLASDELL, N. Y.

EXOLON
Magnetic Separators

AT ARKANSAS PORTLAND CEMENT CO.

Cordeau-Bickford Detonating Fuse and Ensign-Bickford Safety Fuse

A perfect team where teamwork counts. Cordeau-Bickford detonates all loads and connects all holes. It permits split-second rotation, relieving burden, and gaining the greatest efficiency from every pound of explosive used. With Cordeau each cartridge goes with the force of a primer cartridge, thus resulting in better fragmentation.

A Cordeau hook-up may be detonated with a single cap. When Ensign-Bickford Safety Fuse is used to activate the cap—as it is here—the perfect team is in operation. Cordeau with its distinct advantages and Safety Fuse—inexpensive, positive, and reliable—form a combination that makes for lowered operating costs and greater efficiency.

Cordeau-Bickford Detonating Fuse is manufactured with the same precision that has made Ensign-Bickford Safety Fuse famous since 1836. Let us send you our Centennial Book—and tell you more about Cordeau and Safety Fuse.

1836 BEGINNING A NEW CENTURY 1936 · ENSIGN-BICKFORD SAFETY FUSE ·

CB-56

The ENSIGN-BICKFORD COMPANY, Simsbury, Connecticut
SAFETY FUSE Since 1836 • CORDEAU-BICKFORD DETONATING FUSE

You Are Cordially Invited to Attend

the

Twenty-First Annual Convention

of the

National Sand and Gravel Association

Hotel Peabody, Memphis, Tennessee

December 7, 8, 9, and 10

1936

The program will be a practical one devoted to the practical problems of the industry. There will also be exhibition of modern machinery and equipment used in the production, distribution and consumption of sand and gravel.

All who are interested in the sand and gravel industry will be welcomed.

NATIONAL SAND AND GRAVEL ASSOCIATION

Munsey Building

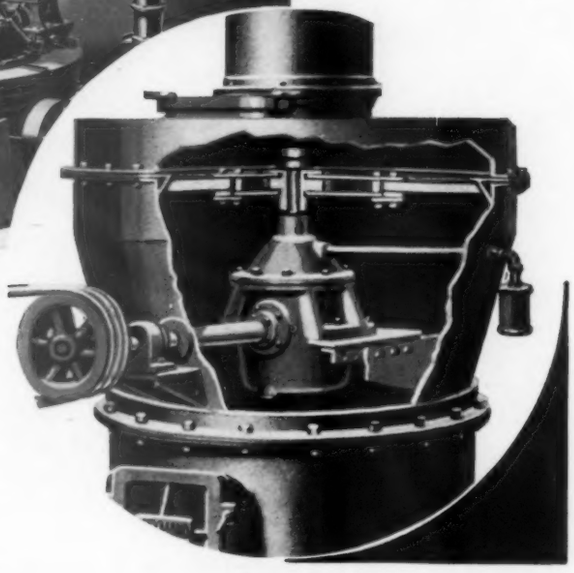
Washington, D. C.

50%
Power Saving
With WHIZZERS

A limestone plant, operating three roller mills with standard separators, had averaged 4¾ tons per hour in producing a finely ground limestone. After equipping two of the mills with Raymond whizzer separators, the output increased to 6¼ tons per hour, so that it was unnecessary to run the third mill. Power costs, figured on a 24-hour basis over a monthly period, were reduced by half, besides the saving in maintenance.

SUPER-FINE SULPHUR

An installation of a Raymond Roller Mill with whizzer separator is successfully grinding sulphur to a fineness of 99% passing 325-mesh. It is operating on a 24-hour basis, and it delivers an average of 5800 lbs. per hour. These results are way beyond anything previously obtained, definitely demonstrating the superiority of the whizzer-type mill for extremely fine production, and for record low costs.



Cut-away view showing how the revolving whizzer is mounted in the separating chamber above the mill. A variable speed control gives instant and infinite regulation of the fineness.

CHALK WHITING

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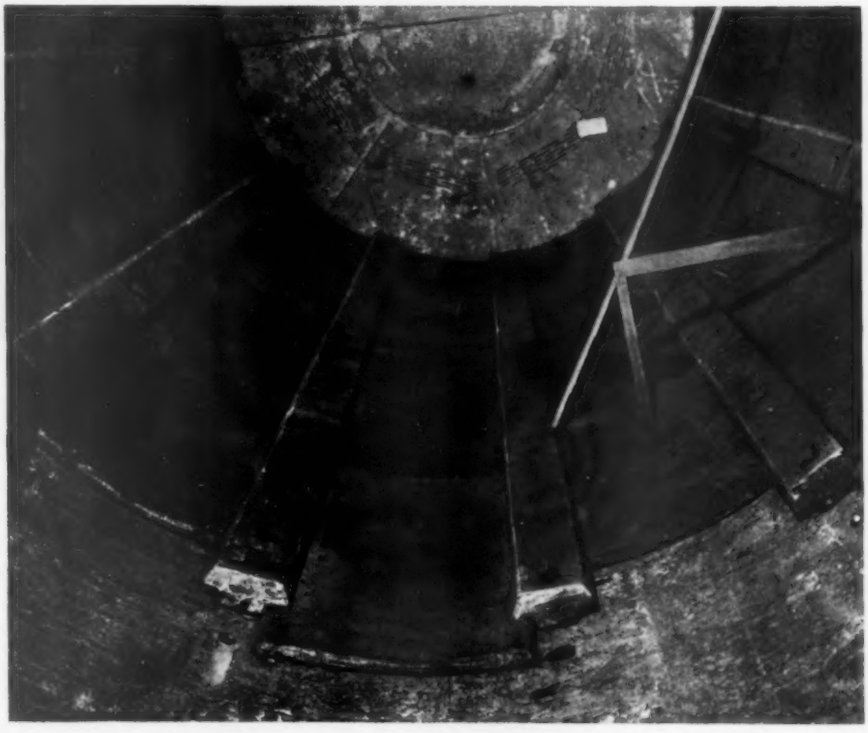

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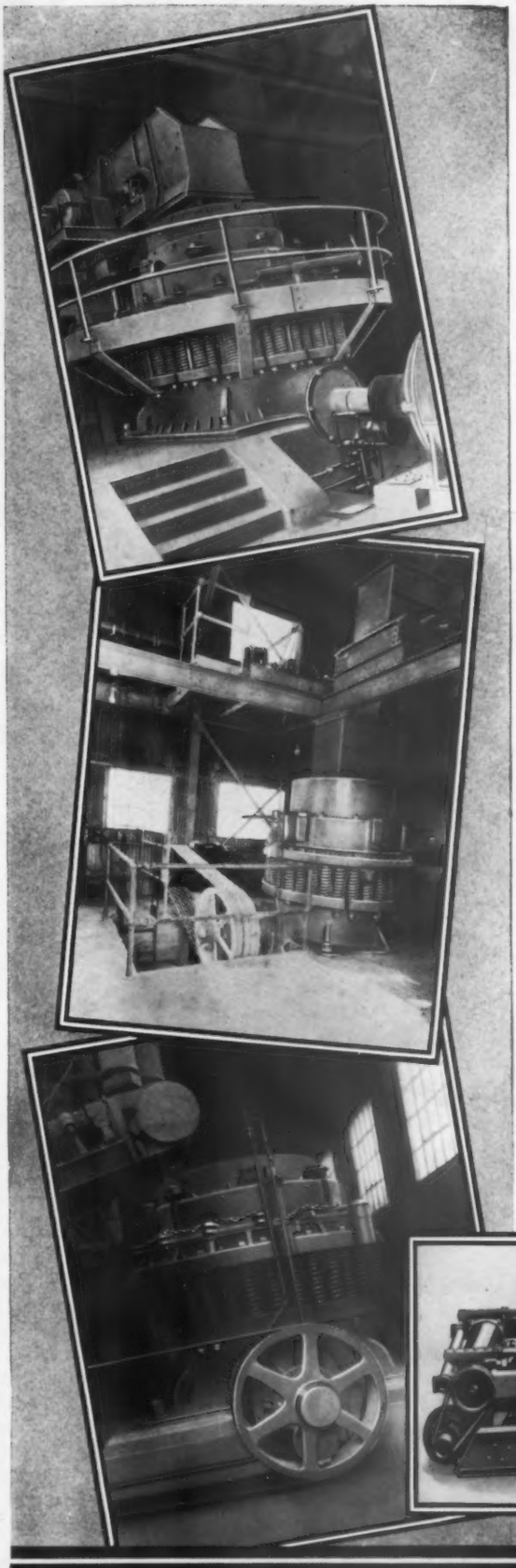

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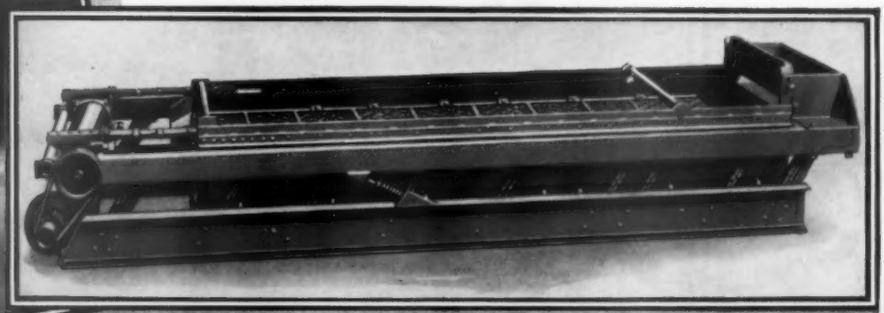

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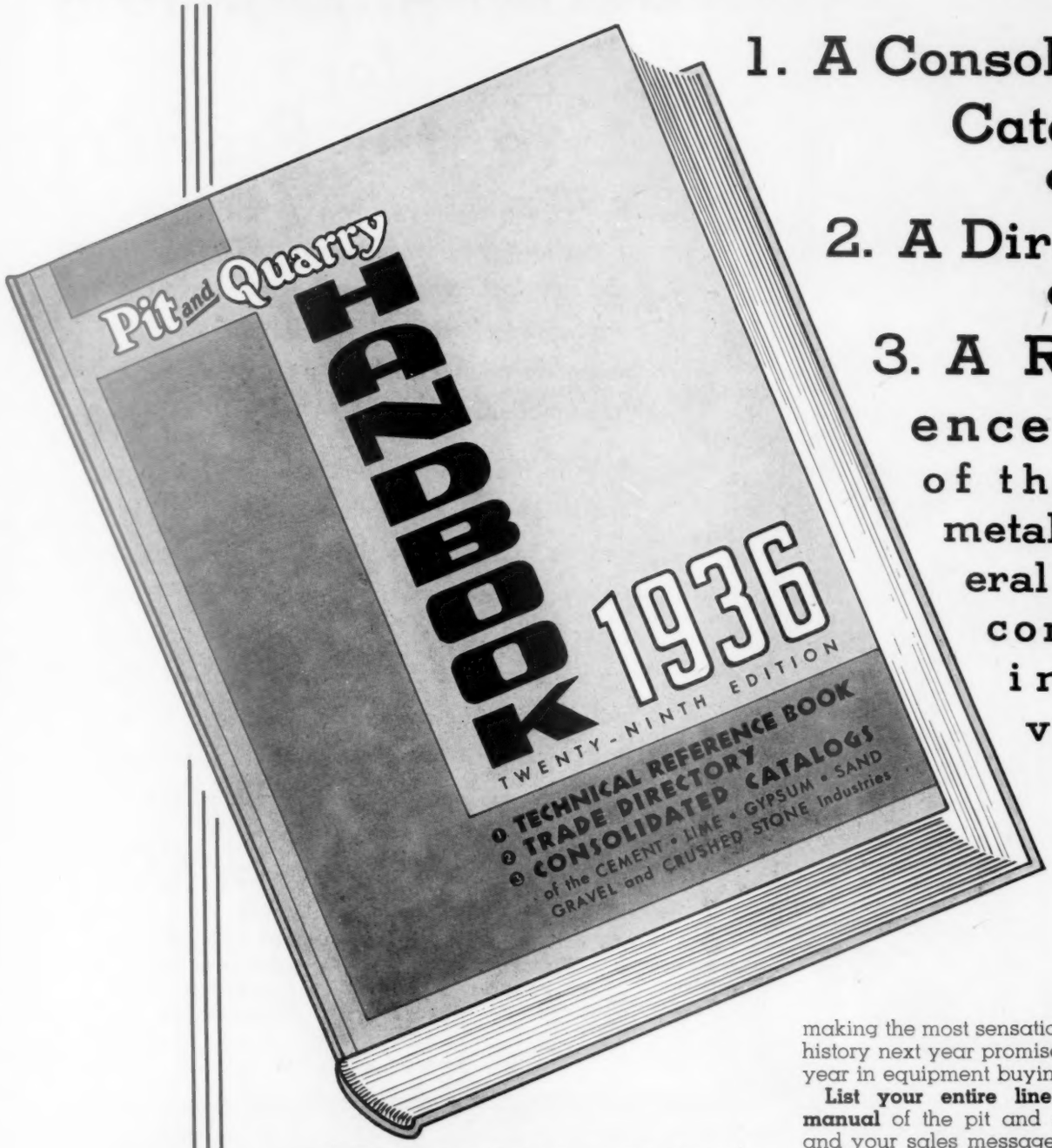

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PIT AND QUARRY

Vol. 29 OCTOBER, 1936 No. 4

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PIT AND QUARRY

CHICAGO October, 1936

Plans Improvements at Plant in Kansas

UNIVERSAL ATLAS TAKING BIDS

Construction of 12 storage silos holding over 125,000 bbl. of cement and nearly doubling present storage capacity, and of a new electrically-operated packing and sack-handling plant that will increase present facilities by 50 per cent. will begin shortly at the Independence, Kans., plant of the Universal Atlas Cement Co., according to C. M. Carman, plant superintendent.

Built of reinforced concrete, each of the 12 silos will be 80 ft. high and 26 ft. in diameter. A compressed air-pump, electrically driven, will convey cement from the mill to the storage silos at the rate of 300 bbl. per hr. A screw-conveyor system will carry cement as required from storage to the new packing plant for sacking and delivery to nearby cars.

"These improvements will be additions to present equipment," Mr. Carman said, "and will enable the company to store adequate stocks of cement against demand, thereby assuring prompt delivery even in rush construction seasons. They also will provide the extra storage space needed for special types of cement required on certain highway and other projects."

Bids are being taken and it is expected that construction will start shortly.

Celebrate Completion of Highway in California

In celebration of the completion of the American Canyon cut-off highway between Vallejo and Cordelia, Cal., employes of Lindeman Brothers, a Stockton, Cal., trucking company, and of the Calaveras Cement Co. shipping department and packing house were entertained at a dinner recently.

The concern trucked 35,000 bbl. of cement from the Calaveras plant near San Andreas for use in the new road. The cement was hauled in 60 days.

James Steers, superintendent of the Calaveras company's shipping department, and LaFay Lindeman, head of the trucking company, made talks.

National Gypsum Buys Deposit at Ft. Dodge

The National Gypsum Co. has acquired 326 acres of land underlain with gypsum near Fort Dodge, Ia., adjacent to present deposits being worked by the company. The price was said to be $85,000.

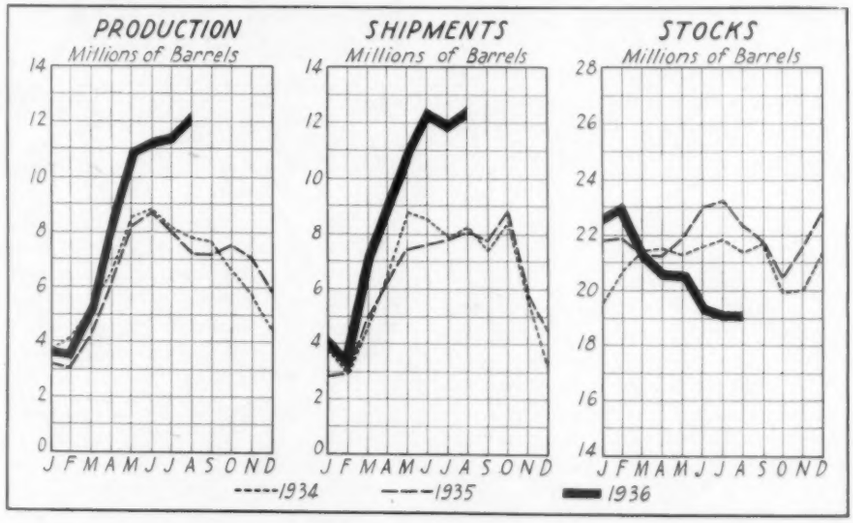
A new board plant is to be built in the near future, it is reported.

$175,000 Silica Project Planned in Michigan

★ Plans are in progress for a new $175,000 silica development in Monroe County, Michigan, by the Huron River Silica Corp., whose offices are located in the Dime Bank Bldg., Detroit, Mich.

Mining and processing equipment are to be erected on the company's properties at South Rockwood. Crushing, grinding, mechanical-washing, and classifying machinery are to be installed, with extensive storage and distributing facilities. Robert B. Evans is president of the concern.

CEMENT OUTPUT AT YEAR'S PEAK



Portland-cement shipments in August, 1936, reached the high point for the year and were the best for any month since 1931, according to figures just released by the U. S. Bureau of Mines. Shipments in August were 12,560,000 bbl., compared with 12,417,000 bbl. in June of this year, the previous high mark for the year. Production, too, was at the highest level for any month in the last half decade, reaching 12,535,000 bbl., while stocks remained practically stationary at 18,950,000 bbl.

Production and shipments in August, 1936, showed increases of 73.3 and 55.0 per cent., respectively, as compared with August, 1935, while stocks were 15.5 per cent. lower than a year ago.

The industry operated at 56.2 per cent. of capacity in August, compared with 51.3 per cent. in July and 52.3 per cent. in June. In August, 1935, the ratio was only 31.8 per cent.

"Cracks Down" Upon Gravel-Dredging Co.

FINE ASSESSED MICHIGAN FIRM

A fine of $125 with costs of $33.75 and civil damages of $2,194 have been paid by the Ecorse Transit Co., Ecorse, Mich., for removal of sand and gravel from the bottom of Lake Michigan near St. Joseph, Mich., without the required lease-rights from the state's department of conservation and shore-line property holders. The company was accused of dredging from the lake bottom after its lease had expired and in addition had operated within an area not covered by the original terms of their lease which, according to the rules and regulations of the conservation department, gave the shore property owners at the time the exclusive lease rights. These exclusive lease rights are now unlimited in Lake Michigan.

The Ecorse Transit Co. pleaded guilty in circuit court at St. Joseph and paid the fine and costs. In addition the company paid the state civil damages in the amount of $2,194 for the material taken.

This is the first major case of its kind under the Michigan legislative act which went into effect in September, 1935, for the protection of the lake-bottom resources of the Michigan waters of the Great Lakes and the property rights of shore-line land holders. Several other cases are said to have been settled by the payment of civil damages.

"Tightening of regulations governing removal of sand and gravel actually has been forced upon the state of Michigan by those operators who have persistently abused the legal privileges granted them," commented Charles E. Millar, assistant chief of the lands division, Michigan Department of Conservation.

"When the law went into effect about a year ago the conservation commission was authorized to set up regulations. As a protection to shore-line property owners on Lake Michigan, from whom most of the complaints against dredging have come, the commission decided that it would grant permits no closer than a mile from the shore, specifying that dredgers would have to obtain the written consent of the riparian owners to operate within that line.

"It was thought at the time that the one-mile limit would be sufficient to protect riparian owners along the shore of Lake Michigan, but reports began to come in that the dredges would remain outside the mile limit by day and then quietly slip into the forbidden waters after nightfall and continue operations. This abuse of legal privileges and disregard of regulations has forced the commission to rescind its action and give riparian owners on Lake Michigan in effect priority in lease-right privileges. As the regulations now stand no operator can begin dredging operations from the bottom of Lake Michigan within the state's jurisdiction without first obtaining permission of the shore-line land owners and then the proper lease rights from the state.

"Fewer complaints have come from the riparian owners on Lake Superior and Lake Huron and so the 1,000-ft. limit specified by the legislature has not been extended by the commission. On Lake St. Clair and Lake Erie the law says that riparian owners have the lease-rights up to 500 ft. from shore."

Gravel Company Moves to New River Location

All the equipment and operating crew of the Union Sand & Gravel Co. has been moved from Uniontown, Ky., to Caseyville, Ky. The low stage of the Ohio River made it difficult and expensive to get out sand and gravel at Uniontown, in addition to other economic considerations which prompted the move.

Fred Alloway is president of the company which dredges material from the river.

Rock-Wool Plant Soon to Operate at Detroit

★ The recently-formed Campbell Rock Wool Co. of Detroit, Mich., has acquired a two-acre tract at Meyers Rd. and Lyndon Ave., Detroit, improved with a one-story factory building which is to be remodeled and an addition erected for the production of rock wool under a new process developed by the company's chief engineer, Lee R. Campbell. The cost of the plant, with equipment, will exceed $50,000.

General contract for the addition and remodeling has been let to the W. E. Wood Co., Detroit.

Harry L. Pierson is president of the Campbell Rock Wool Co.

Residential Building Volume Records Gain

PRIVATE FINANCING INCREASING

Residential building started during August attained a level of activity not seen since March, 1931, according to figures just released by F. W. Dodge Corp. Not only did the August volume exceed the figure for July by about 41 per cent. but last month's record of residential building contracts was 2½ times the size reported for August, 1935. For the 37 eastern states and the District of Columbia, the figures follow:

August, 1936	$100,522,500
July, 1936	71,993,700
August, 1935	40,528,300

Part of the current gains are attributable to accelerated activities under the PWA housing program, but the bulk of residential work undertaken in August represented private operations. Gains in residential work, as compared with totals for August, 1935, were well distributed geographically, with each major area in the territory east of the Rocky Mountains sharing in the general advance. (On less perfect data, i.e., building permits, striking advances over a year ago were likewise shown for the Rocky Mountain and Pacific Coast districts.)

The total volume of construction awards, covering all types of work, undertaken in the 37 eastern states during August amounted to $275,281,400; this was in contrast with $294,734,500 reported for July of this year and represents a gain of about 63 per cent. over the figure of $168,557,200 reported for August, 1935. The decline from July was chiefly the result of decreased contract lettings for civil engineering projects under the PWA program of the Federal Government.

★ An extensive addition to the main plant of the United States Gypsum Co. at East Chicago, Ind., to cost $125,000 with equipment is about to be built, contract for the construction of the building, 80 ft. by 420 ft. in size, having been let recently to the Sill Construction Co., Chicago, Ill.

Aggregates Output Up 48.7 Per Cent. in 8 Months

Based on U. S. Bureau of Mines figures for cement shipments, the sand, gravel and crushed stone shipped for construction and road-building purposes during the first eight months of this year are estimated to have totaled 145,828,000 tons. This represents an increase estimated at 46,357,000 tons over the first eight months of 1935, or 48.7 per cent.

These figures do not include the tonnage sold or used for railroad ballast, industrial sand, or stone for chemical, metallurgical and a few miscellaneous uses. These are expected to show a similar increase due to the rise in iron-and-steel output, improved general industrial conditions and enlarged railway-maintenance programs.

Silicosis Hazard Is Firm's Responsibility

MECHANICAL SAFEGUARDS NEEDED

Responsibility for the control of the silicosis hazard in industrial plants was laid squarely at the door of the employer by Dr. Roy R. Jones, of the Division of Labor Standards, U. S. Department of Labor, Washington, D. C., at the National Safety Congress.

Speaking at the meeting of the quarry section of the Congress, Dr. Jones said: "The share of responsibility differs sharply from the distribution of responsibility in the field of industrial accidents. In the case of accidents, the employee must share some of the responsibility. A worker may, by one thoughtless action, render ineffective the management's best efforts to prevent accidents.

"Silicosis, on the other hand, does not develop from a temporary or single exposure, and proper supervision of workers offers the management ample opportunity to deal summarily with the careless offender before serious damage can result. Effective control may be stated primarily to depend upon the management's attitude towards a sound comprehensive program of prevention."

Dr. Jones said the prevention of silicosis is dependent upon the application of coöperative medical and engineering methods. Silicosis itself seldom advances to a degree which becomes disabling, unless the condition is complicated by pulmonary infection, he stated.

Adequate medical supervision requires a staff with special training, Dr. Jones declared. "It is not enough that the physicians be basically well qualified in their profession. They must also be familiar with industry to such a degree that they know what health hazards are commonly associated with specific industries. Moreover, they must know the fundamentals of engineering control applicable to these hazards, so that they may coöperate effectively with the engineering staff.

"The medical program should include detailed pre-employment physical examinations; careful, periodic physical examinations; adequate control and study of respiratory illnesses affecting employees, and an effective system of recording and reporting industrial accidents and occupational diseases."

Explaining some of the ways mechanical or engineering methods can be adapted to insure clean air in the work room, Dr. Jones said that where possible, dusty operations should be isolated from other plant activities, thereby exposing as few workers as possible to even a potential silicosis hazard.

"Local exhausts, removing dust at its source and preventing its dissemination into the work room atmosphere, are practical for many operations. To accomplish this, in some instances, may require complete enclosing of the process. When local exhaust or enclosed processes are not effective or practical, air filtering systems or simple general work room ventilation, removing dusty air and replacing it with clean air, may serve to keep the quarters safe."

Dr. Jones said all mechanical or engineering devices used as a means of prevention should receive periodic inspection to insure that they are properly maintained and work efficiently.

"That dust which is collected at its point of origin, and dust removed from the general atmosphere of the work room, should be so disposed of so that there is no chance of its again being circulated in the work room," he said.

Concrete Producer Adds Combined Shovel-Crane

★ A Thew Lorain gasoline-powered combination shovel-crane was recently acquired by the Crystal Concrete Co. of South Braintree, Mass., for use in servicing jobs on which the concern supplies ready-mixed concrete. The crane has a sectional boom which can be built up to 60 ft. in length.

Cement Company Doubles Common Dividend Rate

Doubling the rate paid in the previous quarter, the Missouri Portland Cement Co. has declared a dividend of 25 c. a share, payable October 31 to stock of record October 16.

On July 31 the company paid 12½ c. per share.

Transfer of the control of the Oregon Lime Products Co. from the Bristol interests to minority stockholders was accomplished recently at a meeting held in the offices of the company in Provolt, Ore.

It's Mayor Hartsfield of Atlanta, Ga., Now

William B. Hartsfield, president of the Southern Talc Co., Atlanta, Ga., was elected mayor of Atlanta on September 24 by a handsome majority. Offices of the company are located in the Grant Bldg., where Mr. Hartsfield maintained his campaign headquarters. The company's plant at Chatsworth, Ga., which began operating last year was described and illustrated in the June issue of PIT AND QUARRY.

Joint Conference of Mineral Groups Held

SHALLCROSS, KELSEY ON PROGRAM

The Industrial Minerals Division of the American Institute of Mining and Metallurgical Engineers and the Materials and Equipment Division of the American Ceramics Society held a joint conference Sept. 24, 25 and 26 at State College, Pa. The fundamental purpose of this meeting was to bring the two groups into intimate contact in order that, on the one hand, the A.I.M.M.E. may learn what new uses are being made of their products and what needs exist, while on the other hand, the A.C.S. members had an opportunity to state their requirements as to desired purity of raw materials and learn what methods are proving successful in effecting high purity. Headquarters and the registration desk were located at the Nittany-Lion Inn.

The Industrial Minerals Division of the A.I.M.M.E. is a recently-formed organization, having held its first meeting in New York in February, 1936. It is an outgrowth of the old nonmetallic-mining committee. Dr. Oliver Bowles of the U.S. Bureau of Mines, Washington, D. C., is chairman of the division and J. R. Thoenen, also of the U. S. Bureau of Mines, is secretary-treasurer. H. B. DuBois, Consolidated Feldspar Co., East Liverpool, O., is chairman of the Materials and Equipment Division of the American Ceramic Society, and G. F. Metz, Hardinge Co., Inc., York, Pa., is secretary.

Among the speakers on the program were Samuel M. Shallcross, vice-president and general manager, American Lime & Stone Co., Bellefonte, Pa.; V. V. Kelsey, general manager, Consolidated Feldspar Co., Trenton, N. J.; Dr. B. L. Miller, professor of geology, Lehigh University; and E. H. Fritz, manager of the engineering department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Installs New Separator at Pulverizing Plant

★ The New York Trap Rock Corp. has installed a 14-ft. Sturtevant separator in its stone-pulverizing plant at Verplanck, N. Y. This operates in closed circuit with a 7-ft. by 24-ft. two-compartment mill.

★ Cement-storage facilities are to be erected at Milwaukee, Wis., by the Medusa Portland Cement Co., of Cleveland, O.

Krause Quarry Wins Annual Safety Award

EIGHTEEN OTHERS ACCIDENT FREE

The enrollment in the 1935 safety contest conducted by the United States Bureau of Mines in cooperation with the National Crushed Stone Association was represented by a total of 48 plants—two underground mines and 46 open quarries. In the open-quarry unit, 19 plants completed the contest year without an accident causing loss of time to any of the men.

The yearly safety contests for crushed-stone quarries are based upon reports of accidents and man-hours of exposure which are submitted to the Bureau of Mines by the competing companies. The reports are analyzed by the Bureau; the accident-frequency and accident-severity rates are computed for each plant, and the plants are graded according to the accident-severity rates. The plant having the lowest severity rate, or, if two or more plants had no accidents, the plant having the largest number of man-hours of employment to its credit, is considered as having established the best safety record, and is therefore awarded the safety trophy. All plants, other than the winner of the trophy, that were operated without a lost-time accident during the contest year are awarded certificates of honorable mention for their achievements in the promotion of safety.

Krause No. 1 quarry, near Columbia, Ill., operated by the Columbia Quarry Co., won first place in the 1935 contest and will be awarded the safety trophy for that year. This quarry operated 167,671 man-hours without a lost-time accident during the contest period, maintaining its accident-free record of the two previous years, 1933 and 1934. The total operating time during the three years was 502,656 man-hours.

The 18 other quarries that operated without a lost-time accident and which therefore will be awarded certificates of honorable mention are shown in the following list:

1. Holston limestone quarry, Mascot, Tenn., operated by the American Limestone Co., 122,934 man-hours.
2. Cape Girardeau limestone quarry, Cape Girardeau, Mo., operated by the Marquette Cement Manufacturing Co., 111,928 man-hours.
3. North Branford trap-rock quarry No. 7, North Branford, Conn., operated by the New Haven Trap Rock Co., 95,061 man-hours.
4. Piqua limestone quarry, Piqua, O., operated by the Ohio Marble Co., 87,370 man-hours.
5. Berkeley Nos. 5 & 6 limestone quarry, Martinsburg, W. Va., operated by the North American Cement Corp., 84,396 man-hours.
6. Security limestone quarry, Security, Md., operated by the North American Cement Corp., 75,967 man-hours.
7. Blue Mount serpentine quarry, White Hall, Md., operated by the J. E. Baker Co., 69,811 man-hours.
8. Pembroke limestone quarry, Pembroke, Va., operated by the Pembroke Limestone Corp., 57,982 man-hours.
9. White Haven limestone quarry, White Haven, Pa., operated by the General Crushed Stone Co., 57,012 man-hours.
10. Union limestone quarry, Mt. Wolf, Pa., operated by the J. E. Baker Co., 53,487 man-hours.
11. Middlefield No. 1 trap-rock quarry, near Middlefield, Conn., operated by the New Haven Trap Rock Co., 52,575 man-hours.
12. Union Furnace limestone quarry, near Tyrone, Pa., operated by the American Lime & Stone Co., 47,278 man-hours.
13. Thomasville limestone quarry, Thomasville, Pa., operated by the J. E. Baker Co., 46,626 man-hours.
14. Plainville No. 4 trap-rock quarry, Plainville, Conn., operated by the New Haven Trap Rock Co., 45,079 man-hours.
15. Gasport limestone quarry, Gasport, N. Y., operated by the Wickwire Spencer Steel Co., 42,491 man-hours.
16. Catskill limestone quarry, Alsen, N. Y., operated by the North American Cement Corp., 39,277 man-hours.
17. Summitville limestone quarry, Summitville, Tenn., operated by the Tennessee Cement & Lime Co., 20,132 man-hours.
18. Rocky Hill No. 3 trap-rock quarry, Rocky Hill, Conn., operated by The New Haven Trap Rock Co., 15,374 man-hours.

The period of operation of the 48 individual plants that were enrolled in the contest ranged from 473,660 man-hours down to 15,374 man-hours of exposure. The accident-frequency rate ranged from zero to 276.8 accidents per million man-hours; and the accident-severity rates ranged from zero to 106.8 days lost per thousand man-hours of operation. The average time lost per accident at the open quarries, including the charges for deaths and permanent disabilities, was 351 days. The average duration of disability for temporary injuries only at the open quarries was 39 days.

West Coast Cement Mills Add to Storage Capacity

The MacDonald Engineering Co., Chicago, Ill., has just completed three cement-plant improvements on the Pacific Coast.

Six storage silos 26-ft. by 80-ft. in size were erected at the California Portland Cement Co. plant at Colton, Cal. Eight silos 17-ft. by 61-ft. were built for the Yosemite Portland Cement Co. at Merced, Cal. At the plant of the Calaveras Cement Co. at San Andreas, Cal., a number of improvements were made for the production of white Portland cement. These included a new crusher building, clinker-cooling and packing equipment. An Allis-Chalmers gyratory crusher was installed.

NEW CHILEAN STAMP

Postage stamps usually glorify some noted personage or achievement but it remained for the Republic of Chile to adopt the useful but unornamental power-shovel dipper as the subject of its newest 10-peso stamp. The stamp is reproduced above and illustrates the Amsco Vanderhoef-front dipper used in the Chilean nitrate mines. The American Manganese Steel Co. reports that a large number of these dippers are in use in Chile, not only by the Anglo-Chilean Nitrate Corp. but also by the Chile Exploration Co. in its copper mines.

Patent on Method for Feeding Kiln Granted

U. S. Patent No. 2,054,156 has been granted to Fred A. Finkeldey of Santa Cruz, Cal., on a method and apparatus for feeding rotary cement kilns.

The patent covers a tube which enters the kiln at the feed end, inside of which is a screw feeder or other force-feeding device. The inner end of the tube has sizing apertures and the dry, raw mixture is fed, along with suitable amounts of water or live steam, into the tube and is forced out through the apertures into the kiln in the form of pellets of plastic consistency.

According to Mr. Finkeldey, this method of feeding uniform-sized pellets will result in obtaining clinker of uniform size and will eliminate under- and over-burning.

Mr. Finkeldey is well-known in the cement industry, particularly on the Pacific Coast, and is president of the Puzzolan Cement Corp., 70 Pine St., New York, N. Y.

Constructs Agricultural Limestone Plant in N. J.

★ The Compton Mines Corp. has completed the erection of a new 1,500-ton crushed-stone plant at Patterson, N. Y. Agricultural limestone will also be produced. The plant was designed and most of the equipment furnished by Earl C. Bacon, Inc. Two Hendrick vibrating screens are included in the equipment installed.

J. H. Kempster Talks at Safety Congress

TELLS FOREMAN'S RESPONSIBILITY

When a plant accident occurs the first concern of the foreman should be for the injured worker, J. H. Kempster, general superintendent, Universal Atlas Cement Co., Buffington, Ind., declared in his talk October 6 at the Cement session of the Twenty-fifth National Safety Congress and Exposition at the Ritz-Carlton Hotel, New York, N. Y.

"During the first few minutes after an accident has occurred," he stated, "a foreman should be in complete command of his department. It is time for cool thinking and capable direction while the first important steps are being taken. These steps may mean the difference between a minor and a serious injury, or even between life and death."

Once the injured person is cared for properly, work should be resumed as quickly as possible, Mr. Kempster said. The foreman's next duty is to investigate the accident—promptly, thoroughly and accurately—getting at the basic cause and making use of his knowledge to the end that further accidents may be avoided, the speaker declared.

The foreman should visit the injured man while the latter is absent from work. By doing this the foreman not only helps the injured worker along, but has an excellent chance of driving home safety lessons to the convalescing employee.

"No deed that one can do results in greater pleasure and satisfaction than that action which places a kind, neighborly service before self and gives evidence that the foreman takes a human interest in those associated with him in his daily work," the speaker concluded.

New Patman Bill Would Curb Sales by Makers

A new bill has been prepared by Congressman Patman to divorce manufacturing from retail business. The measure, to be presented in the House of Representatives in January will give manufacturers three years in which to dispose of their retail interests.

The bill, designed "to amend the Clayton Act in order further to protect interstate commerce against restraints and monopolies," is offered as Section 3½ of the Clayton Act. It would accomplish its purpose by barring goods from interstate commerce when they are to be sold at retail by the manufacturer. The vital paragraph reads:

"It shall be unlawful for any manufacturer or any affiliate of such manufacturer to directly or indirectly transport or cause to be transported, in commerce, any article or material produced by such manufacturer for sale or distribution at retail by such manufacturer or by an affiliate of such manufacturer."

Canadian Concern Adds Rock-Wool Equipment

★ Gypsum, Lime & Alabastine, Canada, Ltd., with main offices at Paris, Ont., has erected a substantial addition to its plant at Caledonia, Ont., for the manufacture of rock wool.

The product will be marketed under the trade name of GypRoc-Wool and is being made available to the building trade this month.

Lime Company Resumes Operations in Idaho

The increased demand for lime has caused the Crystal Lime Co., Orofino, Idaho, to resume operations. The company's plant had been idle for several years.

Silica Plant in Ottawa Installs V-Belt Drives

★ A 16-strand V-belt drive, supplied by the Pyott Foundry & Machine Co., Chicago, Ill., has gone into service in the grinding plant of the Standard Silica Co., Ottawa, Ill. The drive operates on 68-in. centers and delivers 75 hp. from an electric motor running at 1,160 r.p.m.

Association Publishes Booklet on Stone Sand

The National Crushed Stone Assn. has released to its members copies of a new booklet entitled *Stone Sand*. The merits of the material are discussed, technical advice given and notable structures in which stone sand has been used are cited and illustrated. Additional copies are offered at a nominal charge.

Detroit Producers Aid in Building Model Home

The Peerless Cement Corp., the Belle Isle Lime Co. and Cinder Block, Inc., all of Detroit, Mich., are among the 21 manufacturers coöperating in the erection of a model home in Detroit. The entire structure is being built with Detroit-manufactured materials.

International Bonds Converted to Stocks

BENEFIT FROM RISE IN MARKET

Issued only last November, the International Cement Corp. 4 per cent. debentures seem destined to make their exit within the next few months.

The conversion price for the common stock will be automatically increased to $40 a share on next January 1, and in view of the present level at which the shares are priced it would seem that most of the $12,000,000 debentures will be converted before that date. At present the conversion price is $35 a share.

These bonds were brought out last November at par and are now quoted around 160. Proceeds of this issue were used to redeem approximately $12,000,000 of 20-yr. 5 per cent. convertible debentures.

Because of their stock privilege the bonds have been among the most volatile on the New York exchange. Their low this year was 115⅜. Since their listing they have not sold below 108.

The conversion price after January 1, 1937, will remain at $40 a share up to January 1, 1941. Thereafter up to November 1, 1945, the price will be $45 a share.

The Wall St. Journal points out that, when the conversion figure is advanced to $40 a share, only 25 shares of stock can be obtained for a $1,000 debenture compared with 28 shares plus cash equal to 4/7 of a share at present. Therefore, assuming the common stock is selling on January 1, 1937, at about the current level of 56, the debenture price equivalent would be $1,400 instead of $1,600. By converting at the present time the common stock dividend of $2 a share would mean an income return of 5.7 per cent., compared with only 5 per cent. after the price is moved up to $40.

Recuperators Installed at Four Kosmos Kilns

★ Four short-plate Vanderwerp recuperators of the latest type have been built by the Manitowoc Engineering Works, Manitowoc, Wis., for installation on the 7-ft. rotary kilns in the Kosmosdale, Ky., plant of the Kosmos Portland Cement Co.

★ Ten new Diamond T trucks equipped with Rex mixers, the latter supplied by the Chain Belt Co., have just been added to the fleet of the Ready Mixed Concrete Corp., Minneapolis, Minn.

. . . Editorials . . . . . .

Hark! The Consumer!

DESPITE the often-repeated admonitions of copywriters and salesmen concerning the advisability of "getting the buyer's point of view," buyers and sellers considered as classes are at least as widely separated as they ever were. The principles which these students of consumer psychology have so successfully applied in countless individual transactions have brought results which they like to think of as a "harmonizing of different viewpoints." Perhaps it would be more accurate to describe the outcome of their efforts as a diversion of the buyer's attention from considerations of self-interest to those of pure acquisitiveness rather than as a destruction of class antagonism. For, whether we are pleased to acknowledge it or not, the interests of buyers and sellers are as antipodal as those of any of the other great classes, such as debtors and creditors or employers and employees, that constitute society. What is more, the feeling between them may become, and indeed has been, as sharp and uncompromising as that between any of the other groups.

Class solidarity arises from a general realization of the interdependence of group members and of their individual share in common problems, common objectives and common dangers. It is the quality which distinguishes a class from the populace; it is the sense of unity which gives a class economic, political and spiritual power. It emerges from a feeling of injury, fancied or real, and depends for its continuance on the continuation of that feeling. Buyers of all types have it to some degree and attempt, either individually or collectively, to protect themselves against the burdens that oppress them and the dangers that threaten them. Sellers, too, experience the same feeling of misgiving, the same sense of oppression, and adopt measures to conserve their interests and to safeguard their future. Even when these wishes for self-protection and self-advancement find no outward expression they are evidence of a class antagonism, whose ultimate manifestations may raise it to the importance and magnitude of a class struggle.

Consumers of all kinds are becoming more insistent upon a recognition of their rights and upon protection from exploitation. The manufacturer employs professional laboratorial technicians to protect himself against the unscrupulous supplier of inferior materials; he often sets up elaborate means within his own organization to make certain that he receives the kinds and amounts of goods and manufactured parts that he considers essential to the maintenance of his own quality or cost-of-production standards. The average consumer of mass-consumption commodities, having no facilities for personal investigation and inspection and insufficient means for the employment of professional advice, turns to consumer cooperative organizations which offer him the counsel, the protection and the security for which he feels a need.

Each type of consumer, availing himself of the methods most accessible to him, tries to fortify himself against what he looks upon as the undependability, the insincerity, the overstatement or the underperformance of some of those from whom he buys. Whether he expects to invest in steel having definite chemical and physical characteristics or in a tooth brush made of first-quality bristles, he feels that he has a right to know whether the metal delivered to him really meets the specifications agreed upon or whether the brush is, in fact, not made with split goose quills instead of bristles as represented. He feels, too, that he wants to pay no more than the lowest price paid by others for the same quality and quantity of goods and that the terms of sale offered to him are not discriminatorily disadvantageous to him. Each one expects a fulfilment of promises and representations, a full and just performance according to his own understanding of what constitutes fullness and justice, and surrounds himself, as far as he is able, with safeguards for the protection of his interests. When these can not be of his own devising or making, he seeks relief in outside agencies, in manufacturers' associations, purchasing-agents' organizations, consumers' leagues or cooperatives, or the like. If these fail him, he may call for intervention by the government. In periods when the conflict of interests is unusually sharp and relief seems to be too remote he may place little confidence in organizations or other group-pressure movements as means of obtaining adequate protection and, leaping over these agencies as too slow-moving and ineffective, arrive immediately at government regulation as the desired solution. After all, he may reason, civilization rests primarily on the fundamental idea that inequities and unnatural inequalities arising between individuals can be effectively adjusted only through the intervention of an impartial outsider—the government—to whom the authority to decide and the power to enforce decisions has been given. What both seller and buyer really seek is a reliable rule of conduct, or, as Corbin has phrased it, "a prediction as to what society, acting through its courts or executive agents, will do or not do for one and against the other."

The consumer coöperative movement is growing rapidly in America. It is another manifestation of public dissatisfaction, of public mistrust of the policy of "let well enough alone"; it is a part of, and is keeping pace

with, the social thinking of the age. In its transition from the consumer-league stage to the consumer-coöperative stage the consumer-protection movement has given evidence of the increasing need felt by buyers of ordinary commodities for some kind of guarding of their interests, and this growth is reflected in the spread of the movement. Of the more than 60,000 consumers' societies throughout the world approximately 10,000 are in the United States and of their more than 40,000,000 members nearly 6,000,000 are estimated to reside in this country. The extent of the movement will astonish many who have dismissed the consumer-coöperative idea as one of the idealistic hallucinations imported with the immigrants of recent decades. They will also be inclined to be skeptical of the fact that many of these organizations have taken over the productive as well as the wholesaling and retailing functions in the production-use cycle, and that they have joined interests in national and international bodies. Much of the growth of the movement in America must be credited to late years and ascribed to the increasing conviction that consumers, as well as producers, can free themselves to a large extent from economic conditions which seem to be beyond—but have actually been found to be very largely within—their control.

This consumer-protection movement, even though it seems to center about the provision of everyday necessities, is of importance to all types of business, to those concerned with the production of capital goods as well as to those making consumer goods. The fact that important economic functions, commonly thought of as peculiarly within the province of private enterprise, can be, and have been successfully, taken over by consumers may be more than merely suggestive of the possibilities of further development of the idea. It may be indicative of future trends; it may to a great degree determine our economic development. This is true even though the movement be practically confined to the provision and sale of consumer goods, because the development may be a stepping-stone toward the assumption of these economic functions by government.

CONSUMERS interested in coöperation are not of one mind in their attitude toward other enterprises, toward the profit motive, toward trade unionism, or toward the state. The French group of consumers' societies, founded fifty years ago and later known as L'École de Nîmes, believes that economic control is passing from producers and capitalists to consumers, who include not workers alone but members of all classes of society. It holds that value is created by consumption or need and not solely by labor. It does not concede to capital the right either to control production or to take a profit from it. In Belgium, where socialism is powerful, this doctrine of coöperation is not accepted, the right to control the economic world being claimed for labor in accordance with Marxian principles. On the part of so-called "liberal" economists the tendency of the state to intervene in coöperative movements is viewed with disfavor. The coöperative idea needs government help for legislative recognition of its peculiar status, subventions, exemptions from taxes, and other privileges required for the proper working out of its principles. In some cases the government has initiated consumer coöperatives, and in others the government has entered the coöperative field directly. Some "liberal" economists look upon the coöperative movement as an attempt to formulate standards for a "just price" and a "just measure" and object to it because of its interference with the effects of competition operating under a system of self-interest. Even so they admit that it performs a useful service both to the consumer by reducing his exposure to extortion by merchants and by preserving competition from the threats of united producers, and to the worker by increasing his purchasing power and facilitating the creation of savings and the acquisition of property.

"You must become your own merchants and your own manufacturers . . . to be able to supply yourselves with goods of the best quality and at the lowest price," said Robert Owen more than a hundred years ago. This doctrine has been accepted not only by consumers' cooperatives but by great industrialists, who, in order to be certain of the "best quality" and the "lowest price," have taken over more and more of the functions of those from whom they formerly obtained their materials and parts. However, few industrialists have adopted such extreme measures, most of them being content with the assurances of the "best quality" which testing laboratories and rigid inspection can provide and of the "lowest price" obtainable under a competitive system in which "chiseling" buyers eat away much of the earnings of what would otherwise be profitable enterprises.

Coöperation was described by Alfred Marshall, British economist, in 1889 as "at once a strong and calm and wise business, and a strong and fervent and proselytizing faith." "This consumers' movement," writes Roger W. Babson, American economist, in 1936, "—unlike the something-for-nothing clubs—has certain elements which are fundamentally sound. It has something of truth and crusading quality almost like a spiritual revival."

The consumer is a factor to be reckoned with and if he decides, through coöperation, to take matters in his own hands, the effects will be felt by every type of business from the making of foodstuffs to furniture and machinery to cement. "Against such explosions what is the best protection?" asks Babson. "One immediate safeguard is to modernize your advertising and merchandising. Consumers' rebellion can make little headway when business men themselves take the initiative and put character into their production and publicity. Capital is best protected in companies which keep character first. . . ."

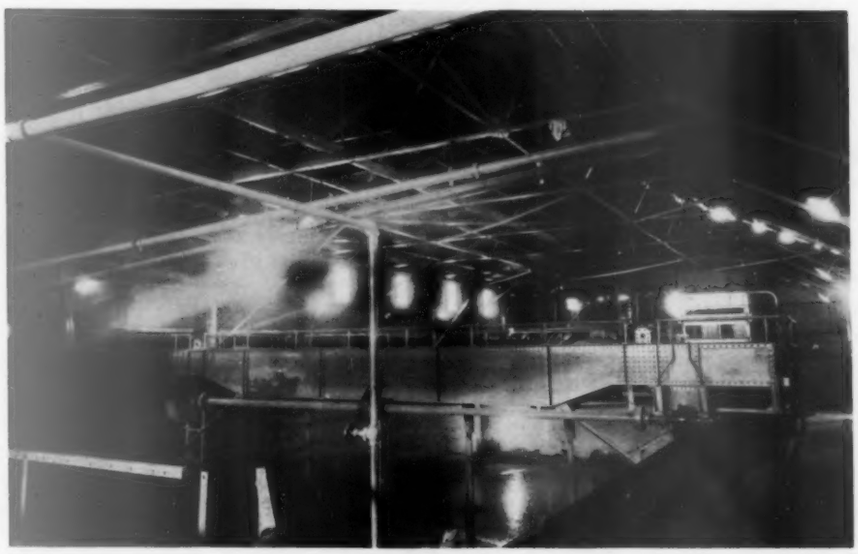
We believe that prevention is better than cure and that intelligent foresight is a rarer gift than wisdom after the fact. Consumers' coöperation has been a matter of historical record for more than a century and the economic history of that period points unmistakably to its present magnitude. Private industry might have done much—and may yet do much—to avert a development so inimical to its own interests.

CANADA CEMENT CO. REBUILDS PLANT

The Belleville plant viewed from the quarry. The new concrete water tank and bulk-loading conveyor are in the background.

AS the latest step in its extensive modernization program begun in 1928, the Canada Cement Co., Ltd., has remodeled its plant near Belleville, Ont. This is the fifth of its plants to be thus improved in a program which, when completed, will include all the eight plants owned and operated by the company. The plants successively improved were those at Winnipeg, Manitoba; Hull, Quebec; Montreal, Quebec; and Port Colborne, Ont. Actual construction was begun at Belleville in September, 1935, and the improved plant was put into operation June 1, 1936.

As was the case in the other plants previously improved the Belleville plant was converted from the dry process to the wet process. A complete new raw-material grinding department, utilizing much of the old grinding equipment, was installed in the former clay-storage building and new clay, kiln and coal departments were installed. Minor improvements were also made in many other departments. The rock-crushing and storage department, which was built in 1924 and had been rebuilt in recent years, was left unchanged, as were also the cement stockhouses, packhouses and loading systems. The old rock-storage and raw-material grinding departments were converted to clinker-storage and grinding and were modernized in the process. The nine old kilns were removed and the old kiln building torn down, refabricated, and rebuilt as the new kiln building. The old coal mill was completely dismantled as were also the old clinker-grinding and gypsum-storage departments. All power-distribution cables were placed in underground conduits. The equipment displaced has been dismantled and removed and demolition of buildings no longer needed is almost completed. This program has greatly increased the economy of operation at this plant and makes possible the production of a more uniform and higher-quality product. These benefits are due not only to a decrease in the number of major equipment units required but also to the considerably greater efficiency of the new equipment which is all of the latest type. These improvements were also made in such a way as to compact the plant considerably, this factor alone being to a large degree responsible for improved operating conditions.



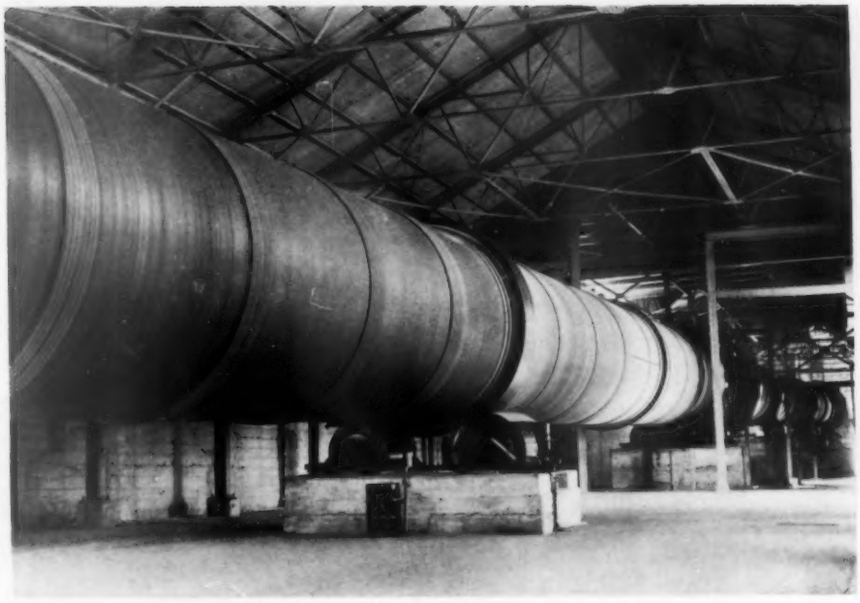
The 75,000-cu. ft. slurry-storage basin and quadruple traveling agitator.

AT BELLEVILLE

The Belleville plant, known as Plant No. 5, is located on the Bay of Quinte at Point Ann, a village about 6 mi. east of Belleville. It is connected by concrete pavement with the Ontario highway system and a privately-owned railway connects the Canadian Pacific and Canadian National Railways, the plant dock and the clay pit. The plant dock is on the Bay of Quinte and can accommodate the largest vessels plying the Great Lakes and the St. Lawrence River. All the coal and gypsum required for plant operation are received at this dock and much of the cement produced is shipped from it.

The original dry-process plant at Belleville was designed and built by the Lehigh Portland Cement Co. which operated it until 1909. In that year it was taken over by the Canada Cement Co., Ltd., which was formed in 1909 through the consolidation of all the cement plants then operating in eastern Canada. This plant was considerably improved in 1920, still using the dry process, and was operated until the summer of 1933 when business conditions forced a shut-down of the plant.

The quarry which furnishes the limestone used at this plant is located adjacent to it. An average analysis of the limestone is as follows:



The new 11-ft. 5-in. by 10-ft. 2-in. rotary kiln is 455 ft. long.

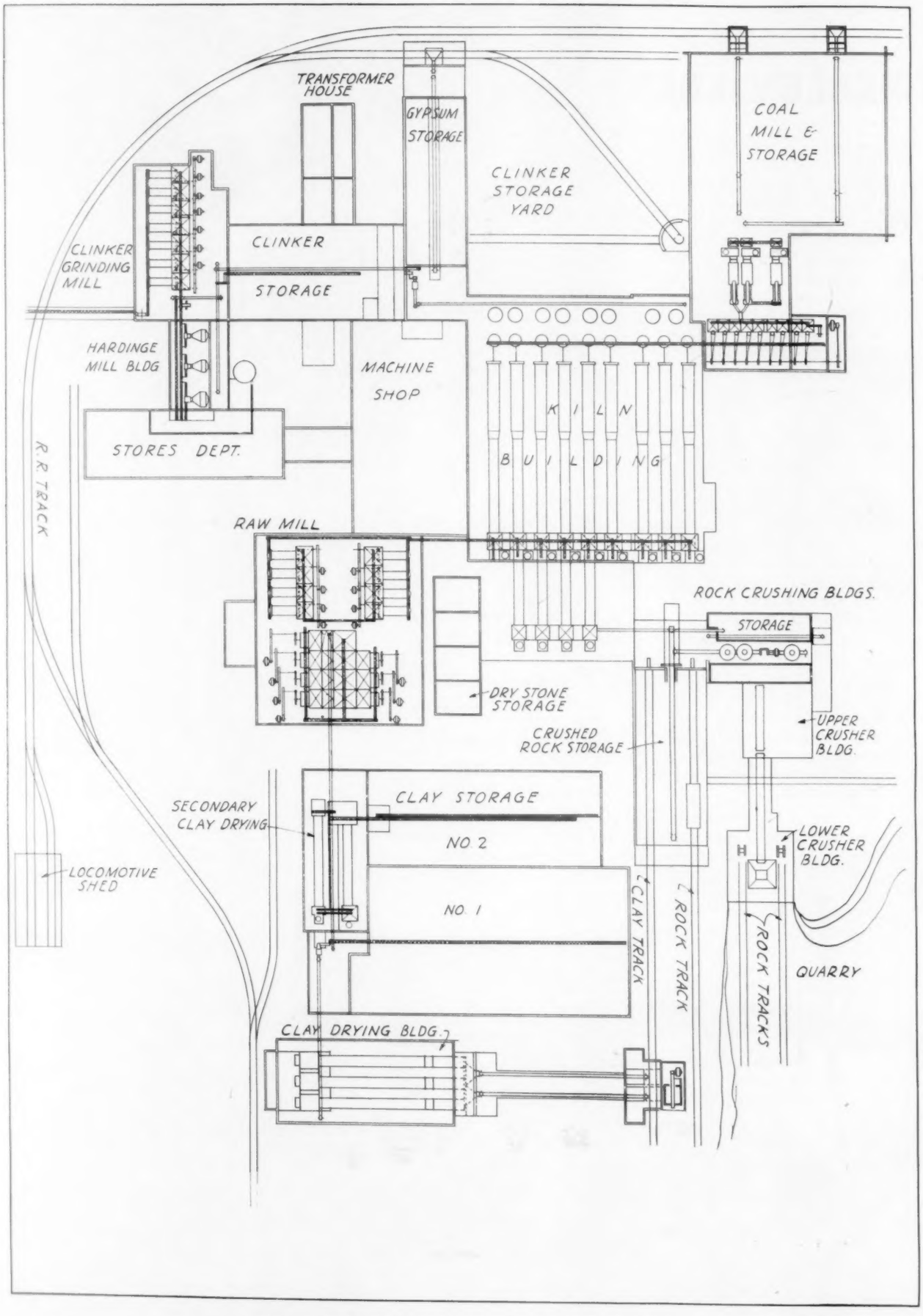
CaO	50.96 per cent.
SiO_2	5.70 per cent.
R_2O_3	1.70 per cent.
MgO	.76 per cent.

The clay pit is about 2 mi. from the plant and is a surface deposit geologically known as Erie clay and commonly known as "red top" as it turns red when burned. The average analysis of this clay follows:

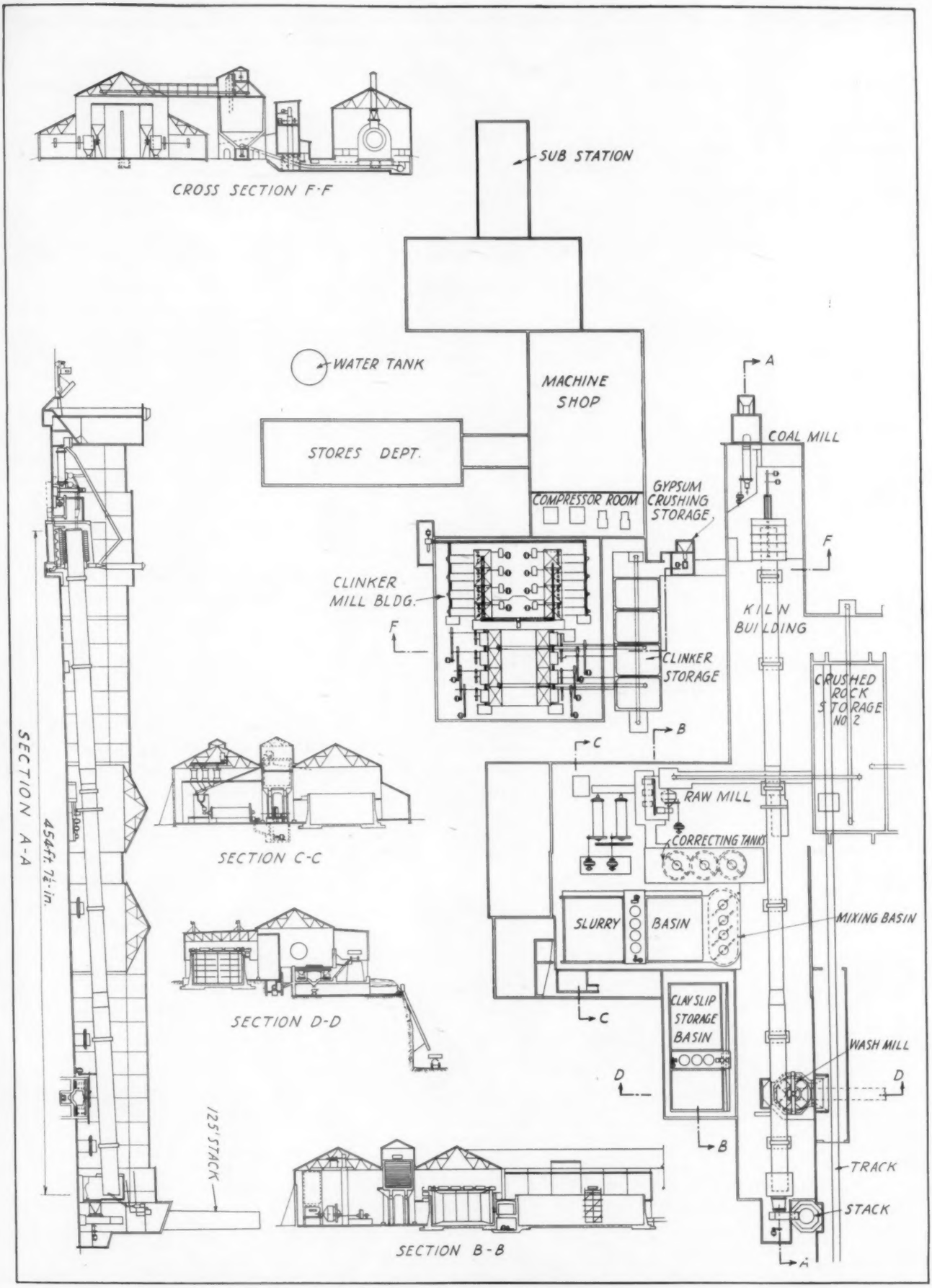
SiO_2	49.85 per cent.
R_2O_3	20.03 per cent.
CaO	9.00 per cent.

The clay is in a shallow deposit lying on the top of the limestone, and varying in depth from 6 to 10 ft. A Model 450 Marion steam shovel, equipped with a 1-cu. yd. dipper and crawler traction loads the clay into 6-cu. yd. side-dump cars. The cars are hauled to the plant by a 30-ton Westinghouse electric trolley locomotive and a 30-ton Vulcan gasoline locomotive and are stored on the track above the wash-mill to which they are fed by gravity as required. The clay-dumping shed is located alongside the kiln building but the wash-mill is in the kiln building close to the kiln. This arrangement saves space and serves to keep the wash-

Self-unloader "Cementkarrier" unloading coal. The conveyor system is for loading bulk cement.



Old lay-out of buildings and equipment at the Belleville plant.



The compact and efficient plan of the Belleville plant as rebuilt.

TABULAR ANALYSIS OF THE OPERATIONS AND EQUIPMENT OF THE CANADA CEMENT CO., BELLEVILLE, ONT., CANADA—PART I

(Key numbers refer to corresponding numbers on accompanying flow-sheet.)

	Operation	Key No.	Equipment	Make	Model No., Size, Capacity or Type	Power Source	Power Transmission
Limestone	Quarrying	1	Well drills	Loomis	Clipper No. 2	10-hp., 900-r.p.m. motor	Belt
		2	Shovel	Marion	Model 61, steam		
			Locomotives	Whitcomb	16-ton gasoline		
			Cars	Continental	6-cu.yd., side-dump		
			Hoist	Flory	Single-drum	65-hp., 600-r.p.m. motor	Gear
	Crushing and Storage	3	Crusher	Traylor	Jaw, 48-in. by 60-in.	200-hp., 600-r.p.m. induction motor	Flat belt and 36-in. Cutler-Hammer magnetic clutch
		4	Hopper				
		5	Feeder	Jeffrey	Apron, 54-in. by 7-ft.	Hammer-mill shaft	Flat belt
		6	Crusher	Pennsylvania	G11, swing-hammer	275-hp., 720-r.p.m. L. D. & M. motor	Direct-connected
			(From 6 and 2a)				
		7	Conveyor	C. C. Co.	Belt, 30-in. by 280-ft., 18-deg. slope	50-hp., 600-r.p.m. motor	Gear train
		8	Conveyor (To 9 or 10)	McCaslin	24-in. by 24-in.	10-hp., 900-r.p.m. motor	Gear train
		9	Storage (To 8)		50-ft. by 120-ft., 3,000-ton		
Sand	Storage and Feeding	1a	Bin		15-ton		
		2a	Poidometer (To 7)	Schaffer	16 in. wide	3-hp., 1,200-r.p.m. motor	Reducer
Clay	Quarrying	1b	Shovel	Marion	Model 450, 1-cu. yd., steam		
		2b	Locomotives (2)	Westinghouse	30-ton electric		
				Vulcan	30-ton gasoline		
			Cars (12)	Continental	6-cu. yd., side-dump		
	Processing and Feeding	3b	Hopper		Grizzly-covered		
		4b	Wash-mill	F. L. Smidth	26-ft. dia.	75-hp. Can. G. E. motor	Flat belt
		5b	Sump		Concrete		
		6b	Pumps (2) (From 6b and 9b)	Wilfley	Model C, 4-in. centrifugal	20-hp., 900-r.p.m. Can. G. E. motors (2)	Direct-connected
		7b	Storage basin		Concrete, 35-ft. by 86-ft. by 21-ft. deep		
			Agitator	F. L. Smidth	Triple, traveling, mechanical-and-air	10-hp., 900-r.p.m. motors (2)	Reducer and chain
		8b	Pumps (2)	Wilfley	Model C, 4-in. centrifugal	40-hp., 1,200-r.p.m. Can. G. E. motors (2)	Direct-connected
		9b	Feeder (To 13, overflow to 7b)	F. L. Smidth	Constant-level type		
Gypsum	Handling, Storage and Feeding		(From boats and 2d)				
		1d	Crane (To 2d and 3d)	Thew Lorain	Gasoline crawler		
		2d	Storage		Open		
		3d	Trucks	(same used for coal)			
		4d	Hopper		Concrete		
		5d	Elevator	Jeffrey	Chain-bucket	7½-hp., 720-r.p.m. Can. G. E. motor	Falk angle reducer
		6d	Crusher	Jeffrey	Swing-hammer, 36-in. by 24-in.	50-hp., 900-r.p.m. Can. G. E. motor	Direct-connected
		7d	Bin		Concrete, 20-ft. by 24-ft. by 30-ft.		
		8d	Feeder (To second flight of 31)		Reciprocating	2-hp., 900-r.p.m. Can. G. E. motor	De Laval 70-to-1 reducer
Raw-Material Grinding			(Stone from 8)				
		10	Conveyor	C. C. Co.	Belt, 24-in. by 125-ft.	15-hp., 900-r.p.m. L. D. & M. motor	Cleveland No. 400, 14⅔-to-1 reducer
		11	Bin		Concrete, 115-ton		
		12	Feeder (Clay from 9b, stone from 12, oversize from 16)		Revolving table	5-hp., 1,200-r.p.m. Higgs motor	Cleveland No. 200, 40-to-1 reducer
		13	Mill	Hardinge	Conical, 10-ft. by 48-in.	550-hp., 2,200-v., 180-r.p.m. Westinghouse synchronous motor	Direct-connected through Falk No. 22C coupling
		14	Elevator	Jeffrey	Chain-bucket	15-hp., 900-r.p.m. L. D. & M. motor	Falk No. 7½ D. A. reducer
		15	Trough		Screw feed, 16-in.		Chain drive from headshaft of 14
		16	Screens (3) (Fines to 17, coarse to 13)	Tyler	Type 400, 4-ft. by 8-ft., single-deck		
		17	Trough	F. L. Smidth	Screw feed, 18-in.	5-hp., 900-r.p.m. Can. G. E. motor	De Laval E1, 80-to-1 reducer
		18	Mills (2)	Vickers	Tube, 7-ft. by 26-ft.	550-hp., 2,200-v., 180-r.p.m. Westinghouse synchronous motors (2) with 75-kw. exciters	Direct-connected through Falk No. 22C couplings
Slurry Blending and Mixing		19	Conveyor	Jeffrey	Screw, 18-in. by 24-ft.	10-hp., 900-r.p.m. L. D. & M. motor	De Laval B1, 14½-to-1 reducer
		20	Sump		Concrete		
		21	Pumps (2)	Wilfley	4-in. centrifugal	50-hp., 1,200-r.p.m. Can. G. E. motors (2)	Directed-connected
		22	Correcting tanks (3)		Concrete 18-ft. dia. by 18-ft. high		
			Agitators (3)	F. L. Smidth	Mechanical-and-air	20-hp., 1,200-r.p.m. L. D. & M. motor	Kennedy-Falk No. 7 D. A., 27-to-1 reducer
		23	Mixing basin		Concrete, 20-ft. by 5½-ft. by 21-ft. deep		
			Agitators (4)	F. L. Smidth	Mechanical-and-air	20-hp., 900-r.p.m. L. D. & M. motor	Falk No. 8 D. A. reducer
			(To 24 or 25)				
		24	Pump	Wilfley	6-in., centrifugal	50-hp., 900-r.p.m. motor	Direct-connected

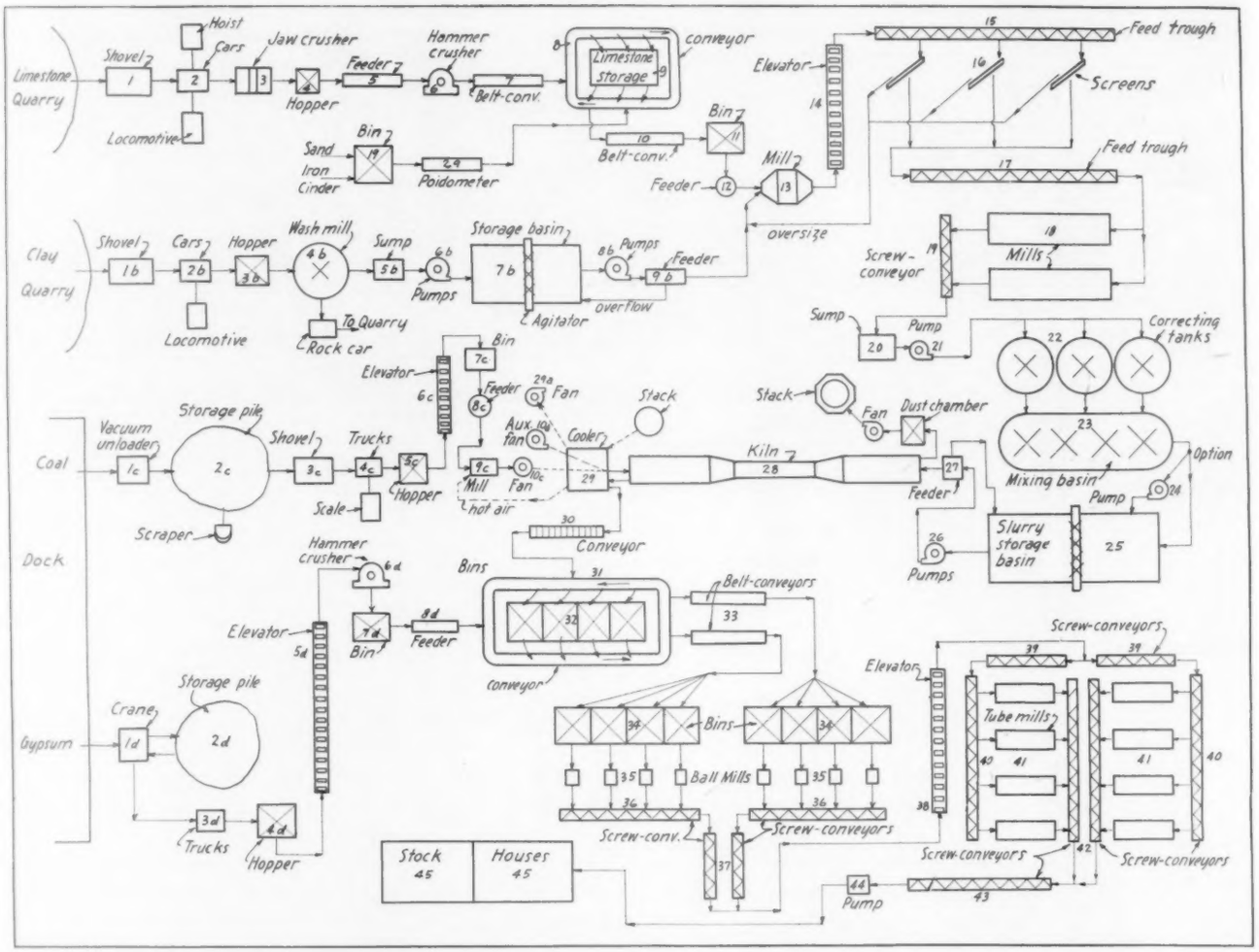
TABULAR ANALYSIS OF THE OPERATIONS AND EQUIPMENT OF THE CANADA CEMENT CO., BELLEVILLE, ONT., CANADA—PART II
(Key numbers refer to corresponding numbers on accompanying flow-sheet.)

Operation	Key No.	Equipment	Make	Model No., Size, Capacity or Type	Power Source	Power Transmission
		(From 23 or 24 and 27)				
Slurry Storage and Feeding	25	Storage basin		Concrete, 43½-ft. by 96-ft. by 21-ft. deep		
		Agitator	F. L. Smidth	Quadruple, traveling, mechanical-and-air	10-hp. and 15-hp., 900-r.p.m. L. D. & M. motors (2)	Cleveland and Foote reducers
	26	Pumps (2)	Wilfley	6-in., centrifugal	100-hp., 1,200-r.p.m. Can. G. E. motors	Direct-connected
	27	Feeder (To 28, overflow to 25)	F. L. Smidth	Constant-level, movable-diaphragm	¾- to 2-hp. synchronous motor; Ideal receiving unit	Direct-connected; Link-Belt silent chain, P.I.V. variable reducer and Falk reducer
Burning and Clinker Cooling	28	Kiln	F. L. Smidth	11-ft. 5-in. by 10-ft. 2-in. by 11-ft. 5-in. by 455-ft.	75/125-hp., 300/1,000-r.p.m. 550-v. d.-c. motor and auxiliary 75-hp. Continental gasoline engine	Falk No. 11 reducer and F. L. Smidth gear-box
		Fan	F. L. Smidth	Induced-draft, No. 48	50/100-hp., 900/1,200-r.p.m. Lancashire motor	Link-belt silent chain
		Stack	Custodis	Concrete, 10-ft. by 150-ft.		
	29	Cooler	F. L. Smidth	Unax grate type		
		Fan	F. L. Smidth	High-pressure	100-hp., 720-r.p.m. motor	Link-belt silent chain
Clinker Storage	30	Conveyor (First-flight clinker from 30, second-flight clinker from 32, gypsum from 8a)	McCaslin	Continuous-pan	10-hp., 900-r.p.m. L. D. & M. motor	Falk No. 8 R. B. 80-to-1 angle reducer
	31	Conveyor (To 32 or 33)	McCaslin	24-in. by 24-in.	10-hp., 900-r.p.m. motor	Gear train
	32	Bins (4) (To 31)		Concrete, 20,000-bbl. total cap.		
		(From 31)				
Clinker Grinding	33	Conveyors (2)	C. C. Co.	Belt, 24-in. by 90-ft.	10-hp., 900-r.p.m. motors (2)	Falk No. 5 D. B. right angle reducers (2)
	34	Bins (8)				
	35	Mills (8)	F. L. Smidth	No. 66 Kominuters	100-h.p.,600-r.p.m. motors(8)	Flat belts
	36	Conveyors (2)	Jeffrey	Screw, 14-in. by 44-ft.	15-hp., 900-r.p.m. motor	Cleveland No. 400 reducer
	37	Conveyors (2)	Jeffrey	Screw, 14-in. by 44-ft.	15-hp., 900-r.p.m. motor	Cleveland No. 400 reducer
	38	Elevator	Jeffrey	Bucket	15-hp., 900-r.p.m. motor	Falk No. 5 D. B. right-angle reducer
	39	Conveyors (2)	Jeffrey	Screw, 14-in. by 48-ft.	10-hp., 900-r.p.m. motor	Cleveland No. 200 A. H. reducer
	40	Conveyors (2)	Jeffrey	Screw, 14-in. by 44-ft.	15-hp., 900-r.p.m. motor	Cleveland No. 400 R. T. reducer
	41	Mills (8)	F. L. Smidth	No. 16 tube	200-hp., 600-r.p.m. Can. Westinghouse motors (8)	Falk No. 11 H. A. reducers
Cement Storage	42	Conveyors (2)	Jeffrey	Screw, 14-in. by 48-ft.	15-hp., 900-r.p.m. L. D. & M. motors (2)	Cleveland No. 400 reducers
	43	Conveyor	Jeffrey	Screw, 14-in. by 96-ft.	15-hp., 900-r.p.m. L. D. & M. motor	Cleveland No. 400 reducer
	44	Pump	Fuller	8-in., Style B Fuller-Kinyon	125-hp., 900-r.p.m. Can. G. E. motor	Direct-connected
	45	Stock-houses (2)		250,000-bbl. cap. each		
		(From boats)				
Coal Handling and Grinding	1c	Vacuum unloader	Fuller	Airveyor, railway-mounted		
		Exhauster fan	Roots-Connersville	22-in. by 42-in.	150-hp. Can. G. E. motor	Texrope
	2c	Storage		Open		
		Drag-scraper Hoist	Sauerman Flory		75-hp., 450-r.p.m. wound-rotor G. E. motor	Direct-connected
	3c	Shovel	Bay City	Full-revolving, crawler		
	4c	Trucks (2)	General Motors	10-ton, dump		
		Scale	Fairbanks	20-ton truck-type		
	5c	Hopper		Concrete		
	6c	Elevator	Jeffrey	Chain-bucket	15-hp., 900-r.p.m. L. D. & M. motor	De Laval No. E1, 29½-to-1 reducer
	7c	Bin		Concrete, 300-ton		
	8c	Feeder		Table	1-hp. variable-speed motor	Motor-reducer
	9c	Mill	F. L. Smidth	Tirax, 5½-ft. by 24-ft.	125-hp., 720-r.p.m., 550-v. motor	F. L. Smidth reducer
	10c	Fan (To 28)	F. L. Smidth	Coal blower	60-hp., 1,800-r.p.m., induction motor	
		Fan (To 28)	F. L. Smidth	Auxiliary air	25-hp., 1,800-r.p.m. induction motor	

mill and dump hopper warm in winter. Sand used to raise the silica content in the mix is also brought to the plant over the clay track and is discharged into a bin in the rock-storage building.

The limestone-quarry face averages 50 ft. in height and has deeply bedded horizontal strata. Blast holes are drilled with No. 2 Loomis Clipper well drills. Forty- and 60-per cent. dynamites are used for primary blasting and 40-per cent. dynamite for secondary blasting. All shots are detonated with Cordeau-Bickford safety fuse. Usually about 150 holes are set off at one time. A portable compressor supplies air for secondary drilling. Stone is loaded into 6-cu.yd. side-dump quarry cars by a Model 61 Marion steam shovel. The cars are hauled to the foot of the crusher-building incline by 20-ton gasoline locomotives.

There are two complete limestone-crushing plants each having its own incline from the quarry. One of these is a railroad-ballast plant which was built in 1926, and which, when operating, also supplies stone for the cement plant. A hoist pulls the loaded cars up an incline and the rock is discharged into a 42-in. Allis-Chalmers McCully gyratory crusher. A pan conveyor feeds the crusher product to four No. 7½ Allis-Chalmers McCully crushers. Belt-conveyors then carry the product of these crushers to four 60-in. by 28-ft. screens and all the stone over 2½ in. in size is discharged into two 54-in. by 24-in. Superior rolls. Belt-conveyors return the product of the rolls to the four revolving screens. Ballast (¾-in. to 2½-in.) is then sent either to stock-piles or to a belt-conveyor which feeds a 250-ton loading bin. A Merrick Weightometer on this conveyor records the shipments. The material (¾-in. minus) too fine for

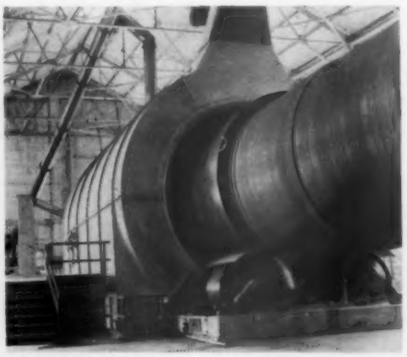


Flow-sheet of Belleville plant. See pages 40 and 41 for tabular analysis of equipment.

ballast is taken by a belt-conveyor to the limestone storage at the cement plant where a McCaslin conveyor distributes it to storage.

When the ballast plant is not in operation the cement plant rock-crushing department is used. This was built in 1924 and has not been changed. The quarry cars are hauled singly up a 15-deg. incline to the floor of the crusher building by means of a single-drum Flory hoist and the rock dumped into the 48-in. by 60-in. Traylor primary jaw crusher which has a capacity of 250 tons per hr. when producing maximum 6-in. stone. The primary crusher product drops into a hopper from which it is fed by a 54-in. by 7-ft. Jeffrey apron feeder to the G 11 Pennsylvania swing-hammer crusher. The product of the hammer-mill drops on the same inclined belt-conveyor which takes the ballast-plant product and is fed to the same McCaslin conveyor. This distributes the stone throughout the storage and reclaims it as required to feed the belt-conveyor which carries the stone to a concrete storage bin above the preliminary raw-grinding mill. Fine sand and iron cinder are also stored in a bin in the rock-storage building and this sand and cinder is fed by a Schaffer Poidometer in correct proportions with the stone into the buckets of the McCaslin conveyor as they are being filled

Looking into the opening between the kiln shell and the cooler with clinker scrapers partly visible.



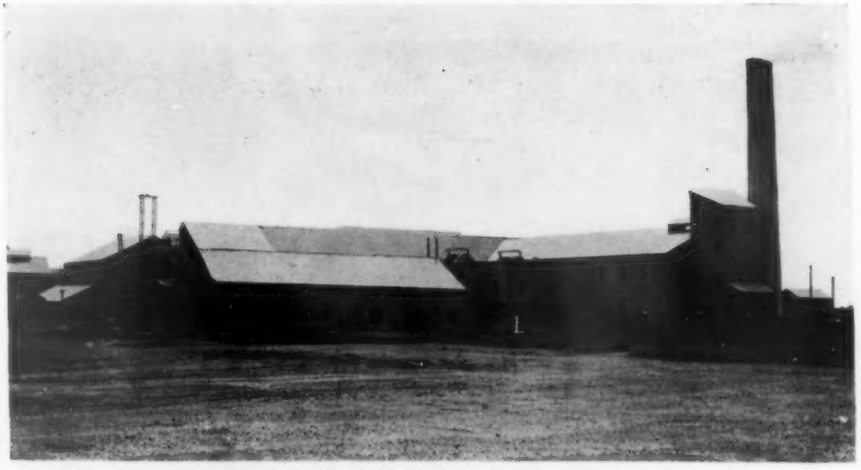
Discharge end of kiln and grate-type cooler. Air-supply pipe in background.

Kiln drive with alternator controlling slurry feed on motor shaft. Auxiliary gasoline engine at right.

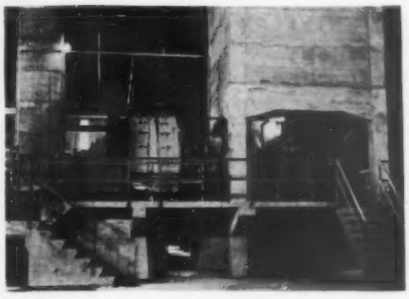
to supply the raw-grinding department. The cinder is added to the mix to decrease the lime-alumina content.

The crushing department operates eight hr. per day and the storage of 3,000 tons has ample capacity to serve the raw-grinding department during the idle shifts and also on Sundays and holidays when the crushing plant is shut down.

The clay cars are dumped singly into the hopper of a 26-ft. diameter F. L. Smidth wash-mill. This feed hopper



Another view of the Belleville plant. New concrete kiln stack at right.

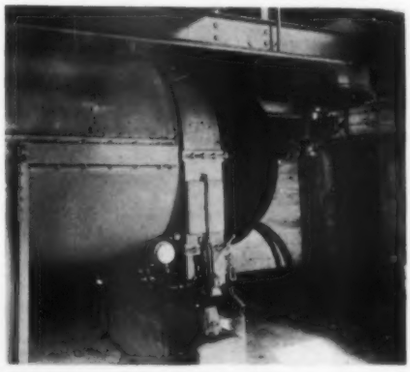


Conical mill for preliminary raw grinding. Bin and feeder at right, elevator at left.

has grid bars spaced 6½ in. apart, which prevent the workmen from falling into the mill, prevent the entire load in the clay car from going into the mill at one time, and stop any large bowlders which may be present in the clay. The clay is worked through the grid bars by means of slicing tools and jetting with a 1-in. hose. Openings in the bottom of the wash-mill provide for the removal of gravel and stone. This material is discharged into a car in a tunnel beneath the mill for disposal.

The clay slip discharged from the wash-mill contains 60 per cent. water and flows into a sump from which it is pumped to the clay-storage basin by two 4-in. Wilfley pumps, one of which is a spare. The reinforced-concrete storage basin is 35 ft. wide by 86 ft. long and 21 ft. deep and has a storage capacity of 1,000 tons, dry clay measure. A Smidth triple traveling mechanical-and-air agitator keeps the clay slip in constant agitation. The clay basin is in a new steel-framed building having a monolithic concrete roof and stucco side walls.

Two 4-in. Wilfley Model C pumps are used to transfer the clay slip from the storage basin to a feeder located above the slurry-correcting tanks. This feeder is of the constant-level type with a swinging spout and knife-edge partition to regulate the feed to the raw mill. A steady flow of material is maintained through this spout, the position of which with relation to the knife edge determines the rate of feed to the mill. A measuring pot is used to check the rate of feed at frequent intervals. The

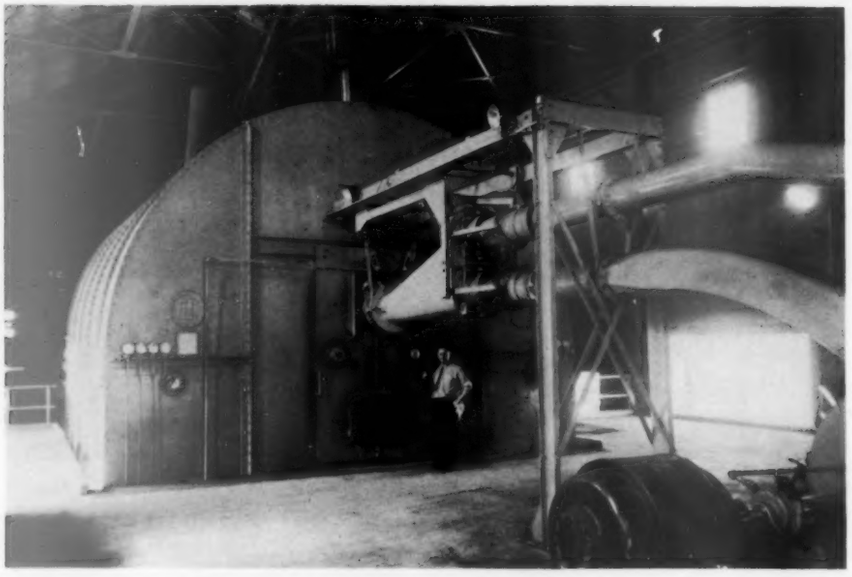


Feed end of direct-firing coal-drying and grinding mill. Table feeder at right.

position of the spout is adjusted from the ground floor of the raw-mill building by a micrometer adjusting device. The overflow from the clay feeder goes by gravity back to the storage basin and the mill-feed slip flows down an 8-in. pipe with a slope of 4 in. per ft. to the feed end of the preliminary raw-grinding mill. This feed pipe passes under the discharge ends of the screens which scalp the raw-mill product and the clay slip picks up the oversize and returns it to the mill.

The preliminary grinding unit of the two-stage raw-grinding system used in this plant is a 10-ft. by 48-in. Hardinge conical mill. This is driven by a direct-connected 2,200-v., 500-hp. Westinghouse synchronous motor which is oversize to allow for power-factor correction. Limestone is fed to this mill by a revolving table feeder from the 115-ton con-

End view of kiln floor showing the cooler, the coal fan and auxiliary air fan. The large fan below supplies air to the clinker cooler.



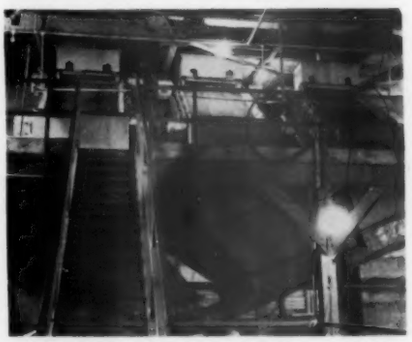
The grate-type cooler which serves also as the firing hood. Hot-air outlet to coal mill and stack for release of excess air above.

crete storage bin previously mentioned and the clay feed is described in the preceding paragraph. The feed end of the Hardinge mill is fitted with a conical drum which conveys the mixture of limestone and clay slip into the mill which is loaded with 60,000 lb. of steel balls of 4-in. size and under. The slurry is discharged from the mill into the boot of a Jeffrey vertical chain-bucket elevator which in turn discharges it to a screw feed trough. Three adjustable gates in the bottom of this trough feed the slurry to three 4-ft. by 8-ft. Tyler Type 400 screens. These are single-deck screens fitted with 10-mesh Ton-Cap slotted-wire cloth and are set on a slope of 30 deg.

The oversize from these screens returns to the Hardinge mill with the clay-slip feed as it has a consistency which would otherwise make it difficult to handle. The fine material passing through these screens flows by gravity to a parabolic slurry-feed trough equipped with F. L. Smidth screw agitators. From this trough the slurry is discharged to two 7-ft. by 26-ft. Vickers tube-mills which are fitted with orifice-type feeders. Iron grinding plates are used in these mills and their grinding charge consists of 50 tons of 1¼-in. balls mixed with punchings to give the best possible grinding efficiency. These mills are direct-connected to 2,200-v., 550-hp. Westinghouse synchronous motors. Finished slurry is discharged from these mills into an 18-in. screw conveyor which in turn discharges to a sump.

The slurry is pumped from this sump to three reinforced-concrete correcting tanks by two 4-in. Wilfley pumps. These tanks are 18 ft. in diameter by 18 ft. high and have a capacity of about 4,000 cu. ft. each. F. L. Smidth mechanical-and-air agitators are used in these tanks. The bottoms of the correcting tanks are 2 ft. above the top of the mixing basin into which the slurry is discharged by gravity. This basin is 20 ft. wide by 50 ft. long and 20 ft. deep, with circular ends, and has four F. L. Smidth mechanical-and-air agitators. Ordinarily slurry flows from this basin to the slurry-storage basin by gravity but a 6-in. Wilfley pump is provided to get a rapid discharge from the mixing tank when it is being used as a batch mixer. The slurry-storage basin has a capacity of 73,000 cu. ft. and is 43 ft. 6 in. wide by 96 ft. long and 21 ft. deep. It is also of reinforced-concrete construction and has an F. L. Smidth quadruple traveling agitator.

Slurry is withdrawn from the storage basin by two 6-in. Wilfley pumps which discharge it to the kiln feeder located in a tower above the kiln building. This is an F. L. Smidth constant-level type of feeder with a dividing plate regulating the rate of feed to the kiln. Slurry is discharged from the feeder



The three electric vibrating screens which return oversize to raw mill through clay-slip pipe below.

into the kiln feed pipe. The excess slurry overflows back into the storage basin and in so doing actuates a paddle-wheel arrangement connected to a blinker light on the kiln control board. As long as this light flashes the operator knows that a steady feed is going to the kiln. The rate of feed is controlled by the kiln operator from the burner's platform. The feeder is synchronized with the kiln speed through the F. L. Smidth patented arrangement consisting of a special motor driving the feeder, which in turn derives its power from an alternator connected to the kiln drive. The speed of the kiln feeder therefore varies with the speed of the kiln and the ratio between these speeds can be adjusted as desired by the burner. The speed of the kiln feeder is indicated on the kiln panel and the amount of slurry feed is also checked at this point several times daily. The slurry is ground to a fineness of 90 per cent. minus 200-mesh and its moisture content averages 34 per cent.

The kiln is one of the largest and most modern in existence and has all

Slurry correction is accomplished in these reinforced-concrete tanks.

the features of design, operation and control which have characterized other installations of F. L. Smidth kilns in recent years. This kiln is 455 ft. long, 11 ft. 5 in. in diameter at the ends and 10 ft. 2 in. at the center. It is equipped with a regenerative chain system at the feed end and has an F. L. Smidth Unax grate cooler. The chain system is about 98 ft. long and has about 3 mi. of chain weighing about 65,000 lb. This chain system is designed to transfer heat from the hot gases to the slurry and does this so effectively in this installation that the slurry leaving the chain section contains only 10 per cent. moisture. The chain section of the kiln is lined with 4½-in. second-quality firebricks, and 4- or 5½-in. second-quality brick, laid on the top of 2½-in. Moler insulating bricks, is used for the next 186 ft. The calcining zone is lined with 8-in. first-quality firebricks and the feed end below the burning zone with wear-resisting bricks. About 30 ft. in the hottest part of the burning

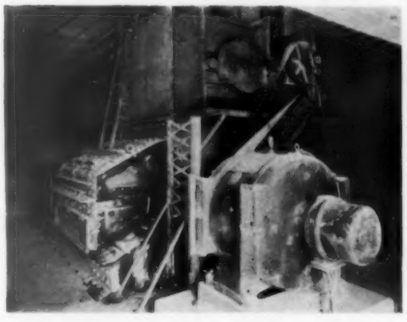
Speed reducer and drive of mechanical-and-air agitators on slurry-mixing tanks.

zone beginning 17 ft. from the end of the coal pipe is lined with "Magnechrome" magnesite bricks. The remainder of the burning zone is lined with high-alumina bricks. The coal pipe extends 20 ft. into the kiln from the end of the shell and is made of heat-resisting metal with provisions for air cooling. Just above the clinker-discharge outlets in the kiln is a brick ring 16 in. thick which builds up a deep bed of material in the clinkering zone thereby slightly prolonging its exposure to the heat at this point.

The rear housing of the kiln is built of steel beams and plates and is lined with 4-in. firebricks. The F. L. Smidth thermocouple and draft pipes are attached to the housing and the gas-analyzer cabinet is on a platform level with the bottom of the kiln shell. Draft at the feed end of the kiln is indicated and the gas analyses and exit-gas temperature are both indicated and recorded on the panel board. The kiln opening in the housing is closed with a Smidth diaphragm-type air seal which prevents air infiltration into the exit gases and thereby reduces the weight of gas to be handled by the induced-draft fan which is a No. 48 Smidth steel-plate fan with overhung blast wheel and water-cooled bearings. The variable-speed motor driving this fan is not used to control the kiln draft, but is used only to determine the most economical speed at which to run the fan. Once this speed has been determined, the kiln draft is controlled entirely by a motor-driven louvre damper controlled from the operating panel. Kiln exit gases are discharged at 380 deg. into the base of a 10-ft. by 150-ft. concrete stack lined on the inside with 4-in. hard-burned red bricks laid in cement mortar directly against the concrete shell.

The feed end of the kiln has two outlet pipes which allow gases to be discharged through the side of the shell and which make it possible to reduce the end opening of the kiln to a small diameter to prevent the spilling of slurry into the rear housing. Openings are provided at regular intervals along the feed end of the kiln shell so that samples of the material can be taken to determine the progress of drying and calcining at those points. Two thermocouples, one 125 ft. and the other 235 ft. from the discharge end of the kiln, record material temperatures inside the kiln.

The kiln has six tires of which five are floating and the thrust tire, No. 3, is riveted to the kiln shell. Each tire is supported on two cast-steel rollers fitted with cylindrical roller bearings. These rollers run in a water-cooling pan and a film of oil on the surface of the water lubricates the roller and tire



Swing-hammer crusher for second reduction of cement raw material.

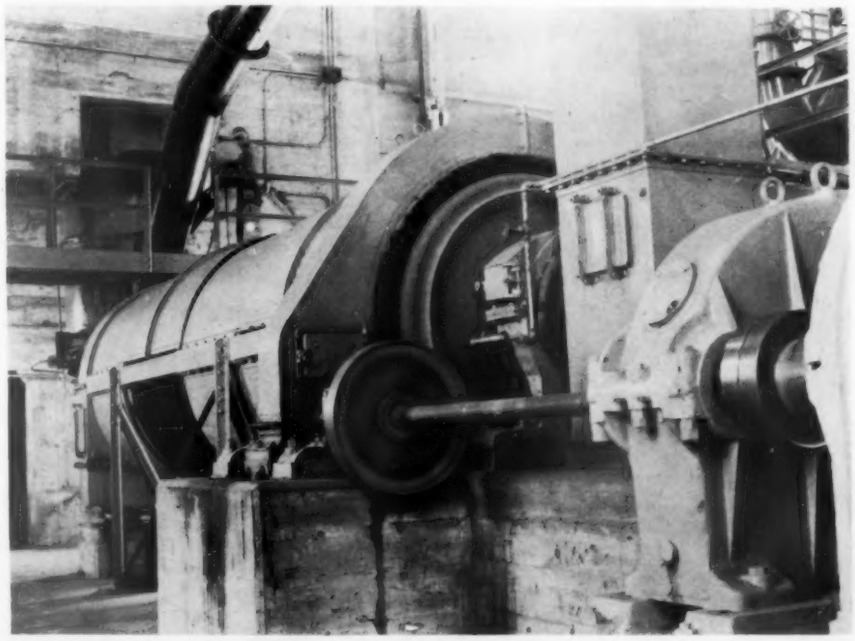
surfaces. At the No. 3 tire a thrust-roller assembly takes the entire end thrust of the kiln. The kiln expands nearly 6 in. each way from the thrust tire. Concrete platforms are provided around the tops of all the supporting and drive-base piers for servicing the equipment. A 300-ton hydraulic jack placed under the tire between the supporting rollers is used to raise the kiln when changing a roller.

The kiln is driven by a 75/125-hp., 300/1,000-r.p.m., 550-v. direct-current motor through a Falk No. 11 D. A. reducer having a ratio of 27.1 to 1 and an F. L. Smidth intermediate gear-box having a ratio of 3.07 to 1. The master gear and pinion have a ratio of 8.6 to 1 and the overall ratio of the kiln drive is 815 to 1. The master gear is attached to the kiln shell by means of 12 spring drive plates. Anti-friction bearings are used on all the shafts in the kiln drive.

A 75-hp. Continental gasoline engine is also mounted on the drive pier which is connected to the high-speed shaft of the Falk No. 11 D. A. reducer through a 1-in. triplex Coventry chain drive and a Falk No. 6 H. C. reducer. This auxiliary drive will run the kiln at a speed of ¼ r.p.m. in case of an electric power failure. Normally the sprocket chain is disconnected.

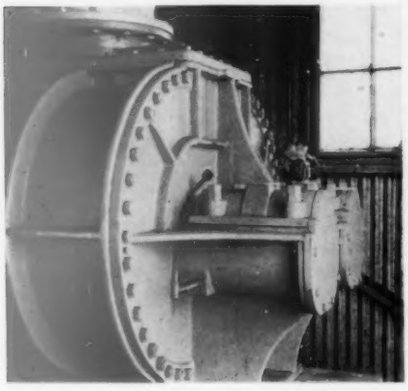
A small alternator, being part of the synchronized feeder system, is connected to the end of the kiln-drive motor shaft and is used to generate the power required to drive the kiln-feeder motor. A magneto is also connected to the alternator shaft which operates the kiln-revolution counter on the panel board. The kiln speed range is from .37 r.p.m. to 1.25 r.p.m. A solenoid brake prevents the kiln from running backward in case of a power failure.

The concrete floors of the kiln room are sloped toward the hot end of the kiln except at the junction of the raw-mill and the kiln buildings where it is level. Open drains in the floor covered with subway gratings allow the flushing of the floors with a hose which is done daily.



Direct-fired mill for drying and grinding coal. Part of the drive mechanism is in foreground.

As the kiln has only been operating a few months reliable operating data are not yet available but enough facts are on hand to indicate that the fuel efficiency will be the lowest of any plant operated by this company. This kiln is estimated to have a normal capacity of 3,200 (Canadian 350-lb.) bbl. per day and is already averaging considerably over 3,000 bbl. The peak of fuel efficiency has not yet been reached but is already down to 65 lb. of 13,500-B.t.u. coal per Canadian barrel.

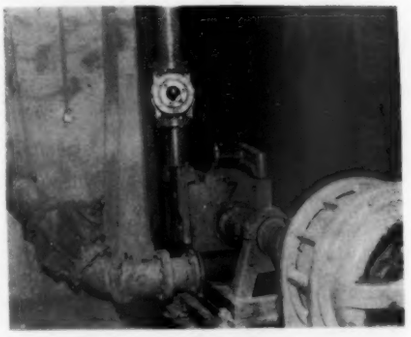


Fan which provides suction for vacuum unloading of coal.

The Unax grate clinker cooler is said to be the first of this type installed in Canada or on the North American continent, although several have been installed in Europe. It consists essentially of a steel housing covering 26 ft. of the kiln shell at the discharge end, the side walls of the housing being lined with firebricks to the center-line of the kiln. The bottom of the housing under the kiln has grates of heat-resisting steel on which the clinker is discharged from the kiln. A series of buckets, scrapers and pushers attached to the kiln shell spread the clinker uniformly over the grate surface and convey it toward the feed end of the kiln for the length of the cooler where it is discharged at a temperature of from 300 deg. to 400 deg. F. As the hot clinker is spread and conveyed along the grates air is blown through it by a high-pressure blast fan. A damper built into the fan discharge is controlled by a Foxboro Air Weight Stabilog which holds the air weight per minute delivered by the fan at any figure required for the operation of the cooler and kiln. All the secondary air required for the kiln passes through the hot clinker and also part of the primary air used for drying the coal and blowing it into the kiln. To cool the clinker to a point where it can be easily ground more air than is required for combustion is necessary and this excess passes through the low-temperature end of the cooler and is discharged to the atmosphere through a by-pass stack. This feature allows the kiln to be operated to its maximum capacity and yet produce low-temperature clinker as the amount of air available for cooling is not limited by the amount of air required for combustion in the kiln. According to company officials the amount of power required to operate this cooler is higher as compared with that of the Unax integral cylindrical coolers, but the maintenance cost should be less although this has not yet been proved by experience.

One of the 10-ton trucks dumping coal to mill-feed bin.

All the coal used in this plant is received by water, usually in the company's self-unloading boat "Cementkarrier" whose self-unloading system is not used when handling coal. A Fuller Airveyor vacuum unloader on a rail-mounted carriage lifts the coal out of the hold of the boat and discharges it on a stock-pile alongside the dock. A Sauerman drag-scraper system provides added storage capacity. A small full-revolving crawler shovel loads the coal from the stock-pile into two 10-ton General Motors trucks which transport it to the plant. There the coal is first weighed on a 20-ton Fairbanks truck scale before it is dumped from the trucks into the hopper of an elevator feeding the 300-ton concrete coal-mill feed bin at the south end of the kiln building.



The 6-in. pump used for rapid discharge of slurry from tanks to storage basin.

A table feeder, driven by a variable-speed motor controlled from the kiln-operating panel, feeds the coal from this bin to the 5½-ft. by 24-ft. F. L. Smidth Tirax direct-firing coal-drying and grinding mill. The feed end of the mill is supported on a tire and slide-shoe bearings and the discharge end by a trunnion running on an oil-lubricated water-cooled bearing. The feed end of the mill shell has four drying clinders 10 ft. long and the discharge end has two grinding chambers about 16 ft. long.

The coal mill operates on the air-swept principle and hot air drawn from an outlet at the top of the Unax grate cooler is introduced to the mill at the coal feeder. In the mill the air dries the coal, which is drawn with it from the mill and blown into the kiln by a special fan. A rectangular steel riser at the discharge end of the mill acts as a final separator which prevents any oversize coal from leaving the mill, the tailings being carried back into the

View showing vacuum unloader on rail-mounted carriage taking coal from boat.

grinding chamber by a return screw. An auxiliary fan installed on the burner's platform blows cold air through the outer portion of the double coal pipe to prevent it from becoming overheated and also blows the flame away from the end of the pipe. The coal pipe has an outer shell of heat-resisting steel.

Thermometers indicate the inlet and outlet air temperatures of the coal mill and orifice gages on the inlet pipes of both fans are calibrated to read in cubic feet of air per minute on a chart furnished with the mill. A differential gage gives the difference in draft between the feed and discharge ends of the mill. The hot-air pipes leading from the cooler to the coal-mill inlet have manually-controlled dampers and a cold-air inlet is provided to temper the air according to the amount of moisture in the coal. With coal running from 4 to 5 per cent. moisture, the air at the inlet end of the mill averages 370 deg. F. The air leaving the mill with the coal is the primary air for the kiln. This has a temperature of about 140 deg. F. and forms from 15 to 20 per cent. of the air entering the kiln.

In this article frequent references have been made to the kiln operating control panel which is located on the burner's platform and it is from this panel that the kiln and all its auxiliaries are operated or upon which

Remote-control mechanism which operates louvre damper regulating the kiln draft.

their performance is indicated. It was designed and supplied by F. L. Smidth & Co. The following list gives the different things indicated or recorded on the panel board.

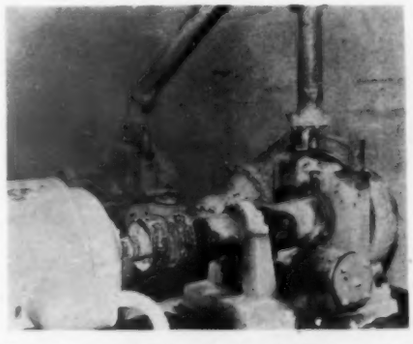
Slurry-feeder revolutions	Recorded
Slurry-feeder r.p.m.	Indicated
Draft-fan amperes	Indicated
Louvre-damper setting at feed end of kiln	Indicated
Draft at feed end of kiln	Indicated
Exit-gas temperates	Indicated and recorded
CO_2 in exit gases	Indicated and recorded
$CO + H_2$ in exit gases	Indicated and recorded

The kiln-control panel with switchboard at the left.

Kiln speed (sec. per rev.)	Indicated
Kiln revolutions	Recorded
Kiln-drive amperes	Indicated
Draft at discharge end of kiln	Indicated
Kiln temperatures at thermo-couples No. 1 and No. 2	Indicated and recorded
Cooler-fan amperes	Indicated
Cool-fan air weight per min	Indicated and recorded
Clinker temperature leaving cooler	Indicated and recorded
Coal mill—Feed-motor revolutions	Indicated
Coal mill—Amperes	Indicated
Coal mill—Fan amperes	Indicated
Coal mill—Damper opening	Indicated
Coal mill—Auxiliary fan amperes	Indicated
Coal mill—Inlet-air temperature	Indicated
Coal mill—Discharge-air temperature	Indicated
Coal mill—Mill differential draft	Indicated
Coal mill—Mill-fan orifice draft	Indicated
Coal mill—Auxiliary fan orifice draft	Indicated

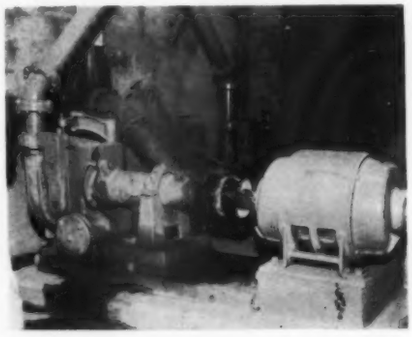
All the above instruments give information necessary to the economical operation of the kiln.

Gypsum is purchased from mines in Nova Scotia and is delivered to the company's dock on the Bay of Quinte in single-deck Canadian lake steamers



Two 4-in. pumps handle the slurry from the mill sump to correcting tanks.

or in the company's self-unloading boat "Bulkarrier." It is then unloaded into railway cars by a locomotive crane and placed in a storage yard adjacent to the coal storage. It is reclaimed from the storage and transported in trucks to the gypsum-storage bins which are located



Two 4-in. pumps transfer clay slip from storage basin to correcting-tank feeder.

over the pan conveyor that carries the clinker to the clinker storage. The trucks dump the gypsum into a concrete hopper from which it is elevated to a 36-in. by 24-in. Jeffrey swing-hammer crusher which discharges the minus ½-in. product into a 20-ft. by 24-ft. by 30-ft. concrete storage bin.

The clinker is discharged from the cooler at a temperature of about 350 deg. F. on a continuous-bucket pan conveyor which passes under the gypsum-storage bin where the proper amount of gypsum is added to the clinker through a reciprocating feeder to control the setting time of the cement.

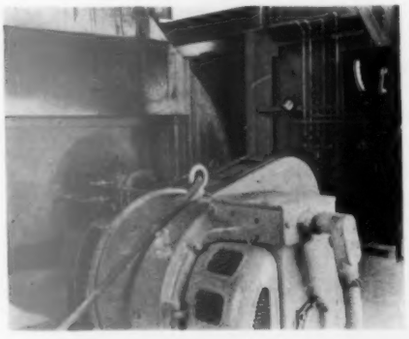
The clinker storage consists of four reinforced-concrete bins which have a total capacity of 20,000 bbl. and were formerly used as dried-rock storage bins. These bins are encircled with a McCaslin conveyor which fills or empties the bins and also delivers the clinker and gypsum to two short belt-conveyors. These conveyors distribute to bins above

eight No. 66 Smidth Kominuters which are used for preliminary grinding of the clinker. From the Kominuters the material is elevated and conveyed to bins above the eight No. 16 Smidth finish-grinding tube-mills. The Kominuters are belt-driven by 100-hp., 600-r.p.m. motors, and the tube-mills by 200-hp., 600 r.p.m. motors through Falk reducers. The present clinker-grinding mill was formerly the raw-grinding mill of the old dry-process plant. Improvements made in this department consisted mainly of reducer drives connected to the tube-mills and to all the elevators and conveyors. The cement from the tube-mills is conveyed by screw conveyors to an 8-in. Fuller-Kinyon Style B pump which sends the cement to the two cement stockhouses.

The cement storage and packing departments have not been changed in

Loading bin of commercial-stone plant. Office at right.

any way. Five hundred thousand barrels of cement can be stored in the stockhouses, and while they are low-type houses, the cement can be reclaimed at moderate cost. The cement for car shipments is sacked in two modern packhouses, each containing four Bates packers, from which the sacked cement is conveyed to the cars by belt-conveyors. A bag cleaning and storage department is provided to care for the handling of both cloth and paper bags. Considerable bulk cement has been shipped in cars from this plant, and these cars are weighed on a 125-ton



The induced-draft kiln fan with variable-speed motor.

Slurry-feed drive consisting of variable reducer, speed reducer and silent chain.

Fairbanks track scale which is located between the packhouse tracks.

Cement is also shipped in bulk from this plant by water. A belt-conveyor in a cross tunnel underneath the floor of Stockhouse No. 1 conveys and elevates cement to a concrete silo of 15,000-bbl. capacity. Cement is discharged from this conveyor over a Tyler Hummer screen which breaks up or removes any lumps which may have formed in storage. From this silo cement is drawn on another inclined belt-conveyor which passes through a long conveyor bridge from which the cement is discharged through swinging-swiveled chutes into the hold of the company's Diesel-electric self-discharging ship "Cement-karrier." A Merrick Weightometer on this conveyor weighs the bulk shipments. This ship transports the cement to the company's storage silos and packing plant in Toronto. From Toronto cement is distributed to all points in the city by truck, and to all other points in the vicinity by rail.

As has been previously stated in this article the old buildings were used wherever possible in the new plant lay-out. The raw-grinding department and the clay and slurry correcting, mixing and storage basins are all inclosed in what was formerly the dried-rock and clay-storage building. These buildings adjoin the kiln building and are kept warm in winter by the heat from the kiln. New roofs were placed on these buildings, and new stucco walls and windows were placed where necessary. The clinker mill is housed in what was the old raw-mill building and the only work required on this building was the construction of a new roof. The use of the old buildings enabled the company to carry out the reconstruction program at a very reasonable cost.

A reinforced-concrete water tank of 50,000-gal. capacity was constructed to insure a secure water supply for the wet-process plant. This tank was erected by the use of continuous moving forms and is perfectly water-tight. The machine shop, electrical shop, stores, wash-room and air compressors were all concentrated in one building, which simplifies the heating and servicing of these departments.

All the power used in the operation of this plant is purchased from the Hydro-Electric Power Commission of Ontario and is delivered to the plant at 44,000 v., 3-phase, 60 cycles. Transformers in the company's substation step the current down to 2,200 v. and 550 v. for distribution to the various plant departments. Twenty-two-hundred-volt motors are used on the raw-grinding mills, the air compressors and the motor-generator sets. Five-hundred-and-fifty-volt a.-c. motors are used in all other departments, except for the kiln and induced-draft fan drives in the kiln department, where 550-v. direct-current motors are used in order to secure the necessary speed control.

Two motor-generator sets are installed in the compressor room—one consisting of a 435-hp., 2,200-v. motor direct-connected to a 300-kw. d.-c. generator which supplies direct-current power for the electric yard locomotive, and the other consisting of a 400-hp., 2,200-v. motor direct-connected to a 200-kw. d.-c. generator which supplies power for the direct-current motors in the kiln department. Two air compressors supply air for general mill purposes at 90 lb. pressure and are each driven by a 200-hp., 2,200-v. motor mounted on the compressor crank-shaft. Air for agitating the slurry is reduced to 50 lb. pressure. The power circuits for all the new departments are 3-wire lead-covered cables laid under ground in fiber-lined conduits — all other circuits are carried overhead.

Cement Production in Germany Rises Sharply

The curve of German cement production is rising sharply, being boosted by the unprecedented volume of private and state construction. The latter includes a most ambitious network of modern automobile roads, airports, and military construction. During the first quarter of 1936 cement production continued to increase and showed an improvement of 80 per cent. over the same period in 1935, the U. S. Bureau of Mines reports. Cement production for the first-quarter periods of the last 4 years was: 1933, 536,000 metric tons; 1934, 1,078,000 tons; 1935, 1,130,000 tons; and 1936, 1,989,000 tons.

In 1935, cement production (8,400,000 tons) was more than double that of 1933 (3,400,000 tons). Exports in 1935 exceeded those of 1934 by more than 100 per cent. and continued to climb in 1936; for the first 5 months of 1936 they rose to a record figure of 242,617 tons, or three times the corresponding figure for 1934.

By WM. E. HILLIARD
Vice-President,
The New Haven Trap Rock Co.

DEPRECIATION AND OBSOLESCENCE IN THE CRUSHED-STONE INDUSTRY

DEPRECIATION and obsolescence are extremely important items in determining the cost of product in the crushed-stone industry, and in presenting a balance-sheet that properly reflects the condition of the business. Depreciation is a decline in the value of property which is certain to occur as a result of wear and tear, along with gradual obsolescence. It is due to the possession and use of the assets and therefore is a part of the cost of operating; and is to be distinguished from fluctuations in value due to causes outside the business itself.

Estimates made in advance to cover depreciation are based on past experience and general practice; but they are always estimates only, as it is not possible to determine exactly the years of life in a depreciable asset, such as a new machine, for example, because much depends upon the extent to which such equipment is used. If business is good, the machine may be run full time every day. If business is bad, the quarry may be reduced to part time or even shut down entirely for long intervals, in which case the wear and tear will be obviously very much less than when the machine is operated full time. On the other hand, when the machine is operated overtime it may wear out much faster than it would if used for ordinary operation. In the crushed-stone industry, where the machinery receives hard usage in the ordinary course of business, the depreciation rates will be higher than in many other kinds of manufacturing.

It is also true that even expensive crushers or screening equipment may suddenly become out of date due to the invention and perfection of new and improved equipment. We regularly expect some gradual obsolescence to take place in a quarry and crushing plant, which is taken care of in the regular rates of depreciation. But extraordinary obsolescence may often become suddenly a matter involving large sums of money. When it has occurred or when it is clear that it will occur in the near future it will have to be treated as an unusual loss in addition to the normal depreciation rate.

Depreciation in the crushed-stone industry is usually written off by one of the following four methods, or in some cases by a combination of two or more of these methods:

1. Straight-line or fixed-percentage method.
2. The diminishing-balance method.
3. The unit-of-production method.
4. The composite-rate method.

Straight-Line Method.—The straight-line method consists of equal annual installments distributed over the useful life of the property. By this method each separate crusher or unit of production is estimated when it is purchased to have a certain number of years of life under ordinary operating conditions; and then each year's proportion is deducted annually. A machine costing $10,000 and estimated to last ten years would be written off at the rate of $1,000 per year. But consideration needs to be given to the estimated salvage value, if any, at the end of the period. In the case of a machine costing $10,000, estimated life of ten years, it might perhaps be estimated that the final salvage value would be $1,000. In that case the annual rate of depreciation would be $900 a year for ten years. Or $1,000 per year might be written off for nine years and if the salvage value at the end was found to be $1,000, no further depreciation would be entered for the tenth year, as the residual value in the books would represent the salvage value of the asset itself.

Diminishing-Balance Method. — By the diminishing-balance method, in the case of a machine costing $10,000 and estimated to last ten years, 10 per cent. is deducted the first year, leaving $9,000. The second year 10 per cent. of the $9,000 is deducted, leaving $8,100 as the residual value. The third year $810 is deducted, and so on to the end, each annual installment being 10 per cent. of the remaining value. When this method is used it would be found that at the end of the tenth year there would still be some residual value in the asset which should correspond closely to the salvage value. Some authorities consider this a good method because the larger depreciation per year is taken early when the value of the machine really does drop more rapidly; and, furthermore, as the machine becomes older toward the latter part of the period, less depreciation is written off annually but presumably more money will have to be spent each year for repairs and up-keep to have the unit operate efficiently.

Unit-of-Production Method. — Some authorities consider that in the production of natural resources, such as those of mines and quarries, the most scientific method is to distribute the depreciation over the units of production in such a way that when the deposit is

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wholly exhausted the plant and equipment will have been adequately extinguished on the books by depreciation. Let us assume that a quarry for producing crushed stone is estimated to contain 1,000,000 tons of recoverable material. If the crushing plant and other equipment cost $100,000, the rate of depreciation over the whole period necessary to use up the whole deposit would be 10 c. per ton. If the production of one year was 76,000 tons, the depreciation for that year would be written off as $7,600. If in the next year the production was 110,000 tons, the depreciation would then be $11,000. It would appear that this method could well be used in the case of smaller and well-defined deposits where a very accurate estimate of the deposit could be made in advance, and where it is probable that the deposits will be entirely used up within a short period of years. In the case of a large deposit, which would be used up only after a long period of time, it would be more difficult to determine the proper rate to be used, although, of course, as the years passed and more accurate estimates could be made of the recoverable tonnage, the rate could be adjusted occasionally in accordance with the facts.

Composite Method.—By the composite method an average rate is determined and applied to the total cost of all plant and equipment items. However, such items as automobiles and motor trucks, which depreciate very rapidly, are kept separate and depreciated at rates usually between 20 and 33⅓ per cent.

The composite rate may be illustrated as follows:

	Cost	Rate	Annual Depreciation
Buildings	$ 50,000	3%	$ 1,500
Equipment, 1st group	80,000	5%	4,000
Equipment, 2nd group	50,000	7%	3,500
Equipment, 3rd group	57,000	10%	5,700
	237,000		$14,700

By dividing the total cost into the total annual depreciation of $14,700 we find the rate to be 6.2 per cent. The rate of 6.2 per cent. of the total cost is, therefore, applied annually until the whole cost has been extinguished.

This method has the merit of simplicity. However, the use of an average, composite rate assumes the normal retirement of assets both before and after the average life has been reached. So that ordinarily this method does not allow for any short-lived asset to be retired separately when it has been used up; because it is balanced in the average rate by long-lived assets such as buildings.

RATES OF DEPRECIATION WHICH HAVE BEEN USED IN MINES AND QUARRIES

(Reproduced from Treasury Bulletin DEPRECIATION STUDIES, Bureau of Internal Revenue, January, 1931.)

	Per Cent.
Blacksmith-shop equipment	6⅔
Carpenter-shop equipment	5
Mine cars, steel	10
Mine cars, wood	20
Crushers, gyratory	6⅔
Crushers, jaw	6⅔
Crushers, roll	10
Drills, air or steam	20
Bucket-elevators	10
Hoists, air	7½
Hoists, electric or steam	5
Loaders, mechanical	14
Locomotives, gas and oil	10
Locomotives, steam	6⅔
Scales, platform	5
Screens	10
Shovels, electric or steam	6⅔
Tramways, aërial	6⅔

Rates of Depreciation.—In all the four methods which have just been described the depreciation rates are based on actual cost, and should never be applied to book values which have been appreciated beyond the actual cost of the depreciable assets.

Due allowance must also be made in all cases for salvage value at the end of the useful life of the asset. Some plants and equipment may have considerable salvage value for other purposes; while other plants and equipment may be almost entirely worthless and have only a little value, or none at all, as junk. In most cases in the crushed-stone industry the probable salvage value would be low.

No set rates can apply universally for similar or identical assets in different locations. In one locality, for instance, steam boilers may depreciate 7½ per cent. per year and in another locality they may depreciate 15 per cent., depending on the use to which the boiler is to be put, the climate, the chemical composition of the water used, the class of labor tending the boiler, the grade and quality of the coal used, and various other factors. Therefore, the rates of depreciation in any quarry and crushing plant should be partly the product of general experience in the industry and partly the result of purely local conditions.

Obsolescence.—Ordinary obsolescence, as we have seen, refers to obsolescence which is gradually accruing due to the normal progress of invention and the arts, but which can not be definitely ascertained. It is simply given some weight and included in the regular rates for depreciation.

Extraordinary obsolescence, on the other hand, is sudden in its occurrence. For instance, a change in the manufacture of a certain product, which is one of several products that a concern makes, may make it necessary to discontinue that line. The special machinery used in making that one product is suddenly of no operating value to the concern, although the machinery itself may be only a few years old. In such cases the cost, less the depreciation already written off on that machinery and less the salvage value, becomes a loss for the year in which the use of the machinery is suddenly discontinued. If it is known more than a year in advance that such an asset is going to become obsolete at some exact or approximate future date, the extraordinary obsolescence would then be spread over the two or more years and not be left to be written off all at once at the end of the period.

Extraordinary obsolescence may be due to a shifting of business centers, a loss of trade, prohibitory laws, new zoning restrictions, a change from steam to electric power, the sudden invention of greatly improved machinery which will be adopted by competing concerns and therefore must be installed to cut operating costs, and various other causes which are entirely different from the wear and tear of ordinary use.

Detroit Rock-Salt Mine Located Within Busy City

The world's second largest salt mine is located almost underneath the feet of the citizens of Detroit. The mine is near Fort street and Oakwood boulevard, in the Motor City. The only salt mine that surpasses the Detroit mine in production is at Retsof, N. Y.

The mine at Detroit is operated by the Detroit Rock Salt company, a subsidiary of the International Salt Co., Inc., and is located 1,135 feet below the surface of the ground. It has two shafts, the larger one, sixteen feet in diameter, being used for bringing the salt to the surface and the smaller one for transporting men and supplies to and from the mine.

General view of plant of Cumberland Portland Cement Co. at Cowan, Tenn. Office in foreground, kiln building in center background.

GRATE-TYPE COOLER IMPROVES CLINKER

AN excellent illustration of the benefits which can be obtained through the application of the latest methods in the production of cement is furnished by the plant of the Cumberland Portland Cement Co. at Cowan, Tenn. This plant, built in 1927, is a wet-process operation using clay and limestone for raw materials, and has a flow-sheet of the type which has become almost standardized in the industry. Early in the summer of 1935 a Lee grate-type clinker cooler was installed on one of the two 150-ft. rotary kilns in this plant and has greatly improved its operation. A substantial increase in capacity has been accompanied by a decrease in fuel consumption per barrel of clinker produced. Other benefits include an increase in the grindability of the clinker.

A complete description of this plant was published in the June 5, 1929, issue of PIT AND QUARRY and there have been only slight changes made since that time. Improvements are now under way in the crushing department but these will not materially affect the operation of the burning department and will be described in a later article.

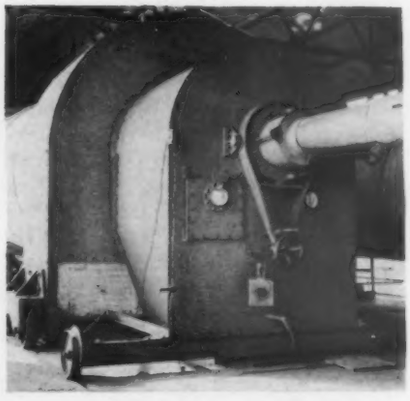
Raw-material grinding is done by two No. 726 Allis-Chalmers Compeb mills, and the slurry is mixed and blended before being fed to the two 10-ft. by 150-ft. rotary kilns. The kiln to which the Lee cooler is connected has been in almost steady operation since the installation of this unit, making it possible to compare its present operation with the results previously obtained.

The kiln is fired with pulverized coal with a heat value averaging about 12,000 B.t.u. per lb. and a 13-per cent. ash content. The coal feeder is of the twin-screw type and is driven through a Reeves variable-speed drive. The original fan supplying primary air has been replaced by a larger one, a Sirocco Size 55-E unit, driven by a 40-hp. General Electric motor.

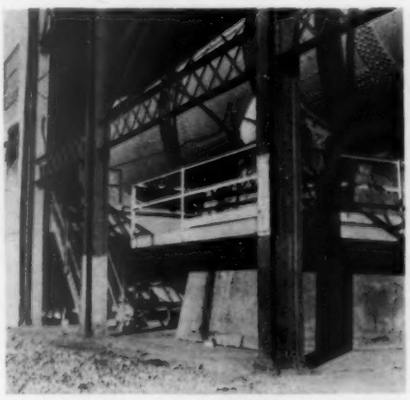
Ring trouble in the kiln, which was formerly an annoyance, has been eliminated. Now a much more even coating of the kiln lining is obtained and when a ring does form, as happens at infrequent intervals, it can easily be burned out by merely slowing down the kiln for about 30 min.

The Lee Process clinker cooler is of the standard type similar to several previous installations which have been described in PIT AND QUARRY. The lay-out in the kiln department was such that it was possible to make this a straight-line installation with the clinker being discharged directly into the cooler below and continuing in the same direction through the cooler which in turn discharges the clinker direct to storage.

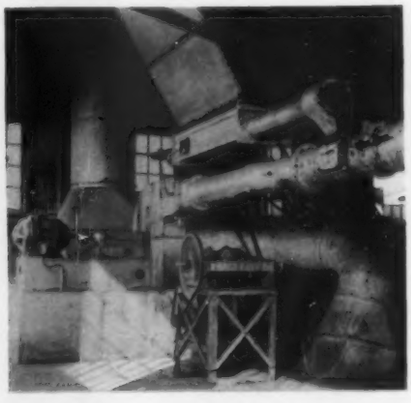
According to Frank Pearson, super-



Kiln hood with coal pipe and connection to cooler.



Part of kiln with grate cooler in background.



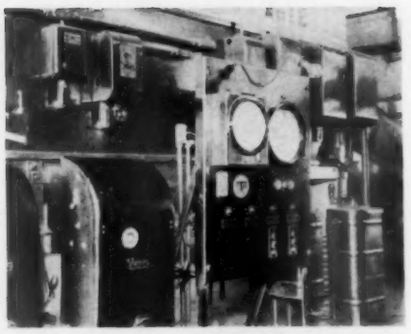
Coal feeder and fan with cooler pipe and stack.

intendent, this factor alone means a substantial saving, as it is not necessary to season the clinker or allow it to cool. The clinker leaves the cooler at a temperature about 20 deg. above that of the atmosphere and can be ground immediately. The extra expense of storing and rehandling, according to Mr. Pearson, is now eliminated and the clinker storage and handling department is no longer needed. Under former conditions it was necessary to keep about 20,000 bbl. of clinker in storage at all times, a considerable inventory expense.

The kiln draft has been reduced considerably and as a result there is little stack dust and the plant is much cleaner than formerly. The cooler preheats the secondary air to about 1,200 deg. F. at a rate of about 11,000 cu.ft. per min. and the primary air to 300 deg. F. at about 3,000 cu.ft. per min. The average increase in production has been 12 per cent. and this has been accompanied by a 13-per cent. decrease in the amount of fuel required per bbl. of clinker burned. According to W. S. Ernst, chemist, there has also been a noticeable increase in the quality and grindability of the clinker. The amount of free lime in the clinker has also been materially lowered and the tensile strength of the cement produced runs about 25 lb. higher at 3, 7 and 28 days than that of the cement formerly produced. Exit-gas temperatures at the stack are now about 1,100 deg. F. compared with former temperatures of about 1,250 deg.

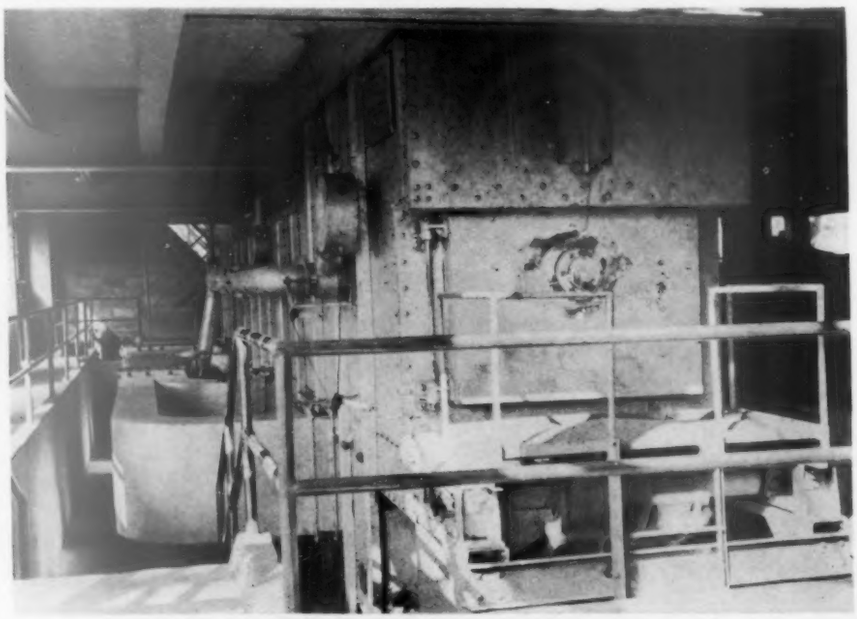
Variable reducer, speed reducer and chain driving cooler grate.

View of cooler from discharge end showing connections to fan duct.



Control board with instruments which control and record operations.

The cooler drag-chain is driven by a 3-hp. G.E. induction motor through a Reeves No. 0 inclosed variable-speed transmission, a Palmer-Bee herringbone-gear reducer and chain. The Sirocco Size 5½ AHS blower for secondary air is direct-driven by a 75-hp. G.E. induction motor. Additional equipment has been added to the kiln-control board. This includes a Hoskins recording pyrometer for the exit air from the cooler, a Foxboro Stabilog which shows in cu.ft. per min. the volume of air coming from the main blower, draft gages, switches, etc. There are also pilot lights which show when the two fans, the dust screw and the clinker drag are running. The entire installation has been made with a neatness characteristic of this plant, which is one of the cleanest in the industry.



Feed end of cooler with drag chain below and air ducts and fan at left.

Burma Goes Independent; To Build Cement Mill

During the last half decade imports of cement into Burma have been steadily increasing, the British Empire, India and Japan supplying the country's requirements. This has been due largely to the lowering of prices to conform with those existing in other countries. As a result, agitation for native producing facilities to render Burma independent of foreign sources of supply has resulted. Recently the Burma Cement Co., Ltd., was formed, according to a report to the U. S. Bureau of Mines from U. S. Consul Winfield Scott of Rangoon.

The newly-organized Burma Cement Co., Ltd., has a capital of 3,500,000 rupees, divided into 350,000 shares of 10 rupees each, of which 277,500 shares of similar denominations have been allotted to Steel Bros. & Co., Ltd., London; the Cement Marketing Co. of India, Ltd., Bombay; the Indo-Burma Petroleum Co., Ltd., Rangoon; and the Tunnel Portland Cement Manufacturers, Ltd., London, and its nominees. Forty thousand shares at 10 rupees each are now being offered for public subscription.

As far as the interests of Burma are concerned, the Burma Cement Co., Ltd., is not included in the merger of the Indian companies, but those companies, through the Cement Marketing Co. of India, Ltd., hold an interest in the Burma Cement Co., Ltd., and the terms of the merger include an agreement by the Indian cement companies to sell to the Associated Cement Companies, Ltd., their respective holdings in the Burma Cement Co., Ltd., at the

nominal fully-paid price of the shares. As the amalgamated cement companies have subscribed for shares in the Burma Cement Co., Ltd., ratably, the sale of the shares at their nominal fully-paid price, notwithstanding that the shares are now at a premium, the arrangement is considered fair and equitable. It is felt that this substantial interest in the Burma Cement Co., Ltd., will be of mutual interest in eliminating any element of competition, and both companies will therefore work for the general advancement of the industry. It is apparent that with this association, the local company will benefit very greatly from the experience and support of the very great organization in India.

Construction of the new cement plant near Thayetmyo, Upper Burma, on the Irrawaddy River, is progressing rapidly with the view of placing the cement on the market at the earliest opportunity. As an indication of local confidence in the new company, shares are reported reliably as having doubled in price. The plant, it is reported, will be capable of satisfying Burma's demand for cement which, in view of the increasing general popularity of concrete construction, both public and private, in the larger coastal and inland residential and commercial centers, should increase materially with the gradual return of favorable economic conditions in this Province.

The fuel for the operation of the plant at Thayetmyo will be natural gas, which is piped from two gas wells owned by the Indo-Burma Petroleum Co., Ltd., Rangoon, and a further future source has been arranged. The limestone and clay deposits embrace an area of 215 acres.

Change from Steam to Diesel Power Proves Economical

By VICTOR J. MILL
President,
Lawrence Machine & Pump Corp.

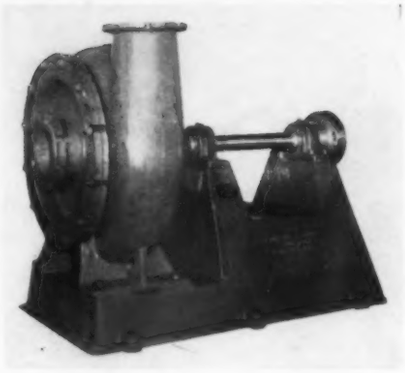
ONE of the noteworthy plant modernizations of the current year in the sand-and-gravel industry is that of Ulster Davis, Inc., of Rensselaer, N. Y. This company is engaged in supplying sand to the brick manufacturers on the Hudson River below Albany for which this region is noted. The sand is dredged from the Hudson River, where it is found in scattered layers or bars of comparatively shallow depth. It is very fine and sharp and is comparatively free of foreign matter.

Until the present season this company operated its dredge with steam power but on account of its high operating cost and because of its favorable experience with Diesel engines on other equipment it decided to install a new pump driven by a Diesel engine. The pump selected is an 8-in. Lawrence standard dredging pump made by the Lawrence Machine & Pump Corp., Lawrence, Mass. It is driven by a 60-hp., Fairbanks-Morse Diesel engine operating at 800 r.p.m. and driving the pump through a reduction gear at 500 r.p.m.

The dredge is equipped with only a plain 8-in. suction as it is desired to dredge only the clean, loose sand.

The material is discharged over a flat screen at the rear of the dredge, and all material over ¼ in. is rejected and wasted overboard. The water with the sand which passes through the screen is led into a sand-drag or wash-box, where the sand is dewatered and loaded on a scow alongside by means of a belt-conveyor.

One of the pictures shows a good view of the front of the dredge and also of the belt-conveyor. The screen and the discharge pipe can be seen at the aft end of the dredge. Another view shows particularly well the sand-drag and the discharge pipe and screen.



Type of dredge pump used.

The pump is of the latest type and is equipped throughout with Shafer, self-aligning, heavy-duty roller bearings.

The output of the plant averages 70 cu.yd. per hr. and has run as high as 100 cu.yd. per hr. This is unusually high for a plant of this size and type and indicates efficient operation and management.

The normal vacuum reading is from 22 to 24 in. and indicates that the pump is working at its utmost.

This change has increased the output more than 25 per cent. and at the same time has effected a large saving in the cost of operation of the dredge.

Two views of the sand dredge loading a scow, showing the sand drag, screen, discharge pipe and loading conveyor.

The Operation of a Successful Ready-Mixed-Concrete Service

By E. B. RAYBURN, JR.

IT goes without saying that no ready-mixed-concrete plant can begin or continue operation unless the ultimate customer is completely "sold." The word "sold" does not mean the mere making of a sale, for any producer who confines his efforts to this function only will not continue in business long. If he is interested in the future, his sales efforts will be supplemented by a complete concrete service calculated to hold customers after the initial sale is made. There is no longer any place in the industry for the fly-by-night operator for the obvious reason that this type of operator can not offer serious competition to anyone who is up on his toes and conscientiously trying to offer a product and service of value.

Personnel.—In the plant of average size the service can be most efficiently handled by one man with complete authority over the plant. His duties may be divided into three distinct functions: (1) plant operation, (2) technical control, and (3) job servicing. Obviously the members of the sales force are not usually qualified for this work because of their training and temperament. The most suitable man is one who has had a technical training but has retained a practical bent, augmented if possible by construction experience or at least an ability to acquire it. While the foregoing may sound paradoxical, men of this type can be obtained to the profit of the producer. Technical ability is necessary to insure the unvarying quality of the product at the lowest cost; it also tends to produce more efficient methods of operation. Needless to say, a practical man is necessary if production is desired, and no job can be properly serviced if the needs and problems of the customers are not thoroughly understood and appreciated.

Plant Lay-out and Site.—No plant should be built indiscriminately; its size and lay-out should be the result of a thorough study. Perhaps it is best to start or remain small, but the set-up should be efficient, large or small. Mere efficiency, however, will not produce concrete at a profit, if the plant is twice as large as need be, or if it is necessary to haul the concrete for 4 or 5 mi. before entering the marketing area proper.

The yard should allow easy access and exit for the trucks and plenty of facilities for washing equipment. The disposal of wash water is an individual problem, depending on the site and its size. Under no circumstances should waste concrete be allowed to accumulate. It is much cheaper to haul it immediately to a dump or, failing that, the concrete should be flooded with water so that it will not be necessary to resort to blasting to remove it eventually from the yard. A few piles of set concrete will cost many times their former sale value before they can be disposed of, as many operators know to their sorrow.

Material Handling and Storage.—There are various good ways of handling aggregates, one of which will prove to be best suited to each individual site. The storage should not be larger than is necessary to insure continuous production. This will depend on the nearness and dependability of the supply as well as the reliability of the handling equipment proper. The covering of stored aggregates seems a waste of money, especially if the turnover is rapid. Stock-piles may be large, if space allows and much winter operation is expected, for it is easier to take materials from a stock-pile than from frozen cars.

The handling equipment should be kept in reliable operating condition and any unit which is continually causing delays because of breakdown should be replaced, as the producer can not expect customers to continue using his concrete if they must regularly submit to costly delays. If the bin-loading equipment is shaky, the bin capacity should be large, and so on down the line. Trouble is rarely encountered with cement-handling machinery and, accordingly, there is no need for four or five cement bins in the average plant.

Mixing and Delivery Equipment.—There does not seem to be any definite yardstick from which we can determine the proper size of the mixer or the number of agitators or truck-mixers necessary to do the job adequately.

In a central-mixing plant the mixer may be of the same size as the delivery unit, or it may have only half the capacity, but never less. The latter might be best for a plant of average size using both large and small units, but if the plant is large and the majority of the units are of large capacity, the mixer should be of corresponding size.

This brings us to the question of the capacity of the agitators or truck mixers. Only a detailed study will give the answer, as it will depend on such factors as the average length of haul, the type of surface traveled, and the type of jobs furnished, — whether large contracts, small retail work, or miscellaneous jobs, both large and small. In turn the large contracts can be broken down into building, paving or industrial work. A good rule of thumb might be large trucks for large plants and small trucks for small plants. In any event no plant should be without the services of a few small trucks to take care of the inevitable fractional loads that are ordered and to insure deliveries where conditions of headroom or clearance prohibit the economical use of large units.

Winter Operation.—A rather complete treatise on winter operation can be found in the *Journal* of the American Concrete Institute for March-April, 1934. Two articles, written by Messrs. R. B. Young and Wilfrid Schnarr, are on the subject of general winter operation, and most operators will profit from a study of their contents. By all means supply enough heating facilities to do the job, as an extra $50 or so spent at the outset may mean a saving of $500 later on. While it is manifestly impossible to operate as easily or cheaply in winter as in summer, no trouble should be encountered in furnishing all the concrete a customer may require in any sort of weather.

Technical Control.—The producer should bend all his efforts to operate on a strength and quality basis, either partially or entirely. Eventually all ready-mixed-concrete plants must produce a quality product or they can not justify their existence.

Preliminary Tests.—Before using or buying any materials they should be tested for their quality and economy. Since any aggregate plant large enough to supply the needs of a ready-mixed-concrete plant will have the facilities to furnish a sound product, it is only necessary to check the grading, sizes of coarse aggregate, etc. If there are several plants from which to choose, the product of one may prove to be the most economical (if all prices are equal) due to voidage, grading of fine aggregate, etc. The apparent specific grav-

ity, absorption and uniformity of the grading should be determined and recorded as this information will be necessary in the design of mixes.

In all probability several brands of cement will be used, and they will vary in fineness, compressive strength and yield. Individual strength curves should be obtained for each cement, using standard mixes and varying the water-cement ratio over the range of use expected.

If possible, the aggregate plant and at least one cement mill should be visited and a thorough study made of their operation. An understanding of the methods and problems of production will be rewarded by a more intelligent and economical use of the materials. A spirit of coöperation may also result in a better product being furnished at no extra cost, which in the long run actually means less cost.

Split-size coarse aggregates should be used by all means. In general aggregates graded up to 1½ in. are used for paving and mass concrete, while building work requires a finer grading, say only up to ¾ in. or 1 in. Since most state highway specifications require the use of split sizes, no trouble should be encountered in obtaining such sizes as are judged most suitable.

If aggregates are obtained from more than one source, it may be necessary to do a little coördinating to obtain a uniform product, but it is worth the trouble.

Mix Design.—There are a great many theories current on the design of concrete for a pre-determined strength, and most of them are good. From the standpoint of workability and simplicity the trial-batch method will produce the most satisfactory results. With the curves from the strength tests on the cements at hand it is a simple matter to choose the water-cement ratios necessary to produce the various strengths desired. These water-cement ratios should represent strengths on the curves which are at least 15 per cent. in excess of the strength expected for each class. Small batches made in the laboratory will furnish information as to the amounts of cement, aggregates and water required for full-size batches. Each strength should be divided into mixes for 1½ in. and 1 in. top-size aggregates, and these should be subdivided to encompass a range of consistencies from wet to dry. Since a given unit of water will produce the same consistency regardless of the water-cement ratio, the trial batch can be run with only one water content and the design for the various consistencies and water-cement ratios expanded from it. The most satisfactory method of obtaining the full-batch quantities is by the use of the apparent specific gravities of the materials. A bulletin of the National Sand & Gravel Assn. goes into this method thoroughly.

The proportion of the fine to coarse aggregate should also be determined by trial and this may be done at the same time that the batch quantities are being arrived at. Different types of aggregates are encountered in different localities, so that most grading curves are of little value. The mixes should contain enough fine aggregate to produce a smooth mix, and this should tend to be on the "oversanded" rather than on the "undersanded" side. It is well to keep in mind that all mixes should not contain the same percentage of fine aggregate. For instance, a lean mix, a wet mix, or one which is made up of a coarse aggregate of comparatively small size, should contain more fine aggregate than when the reverse is true.

Control and Production.—There are very few plants which do not use weighing as the method for batching the materials, with the possible exception of the water. This provides a very flexible means of doing the job, and is especially satisfactory from the standpoint of quantity and quality production. In setting up the weights for the various batches, the average moisture content should be determined and this correction added to the weight of the surface-dry aggregates. No attempt should be made to keep changing these weights with each small change in moisture content, nor should they be set to the nearest 5 or 10 lb.; this is what is known as specious accuracy.

Actual control demands constant vigilance, if a uniform product is to be provided. The mixer or batcher operator should be chosen carefully, as a great deal of the responsibility for the quality and uniformity rests upon him. It is hardly possible to control the total water content by making moisture-content determinations, and it is much simpler to use some method of insuring a constant consistency. It is possible but not practical to do this by visual methods in the case of a central-mixing plant, but it is obviously impossible to use this method for the control of a truck-mixing operation. The only satisfactory method is to use some mechanical device which will indicate the consistency of the concrete at all times. Such a device and the method of control employed is outlined in an article in the *Journal* of the American Concrete Institute for November-December, 1934. Researchers are also at work on a method for determining the moisture content of each batch as it is dumped into the hopper, but to date their efforts have not reached the practical state.

Test Cylinders and Reports.—Tests should be made from time to time on the concrete as it is delivered to the job. Also samples of the cement should be taken from shipments at intervals, and tests made for compressive strength to assure the producer that the cement has not changed during the intervening period. These tests should be confidential and for the information of the plant only. As regards the cylinders made on the jobs to check the quality of the concrete, they are best taken and broken by the customer. The results obtained will be satisfactory from both the customer's and the producer's viewpoint, for they represent an impartial condition and there can not exist even the slightest doubt as to their authenticity. The plant should keep in close touch with the taking and breaking of all test specimens, as it is to the advantage of the producer to know what his concrete is doing at all times, and if any specimen fails to come up to the required strength, he should be the first to know it. In this connection it is well to fill out a daily concrete report on important jobs, giving the batch quantities, water-cement ratio, moisture content, aggregate grading, etc. A record is thus furnished which may be referred to at any time, which is particularly valuable in the event of a dispute. This report form can also contain a space for the recording of any test results which are applicable, and a copy of it can be furnished to all interested parties whenever tests are made.

Advisory Service.—It should be the aim of the producer to become regarded as something of an authority on quality concrete. In such a position he can command the confidence and respect of architects, engineers and customers as well. This will be of direct value in the influencing of specification writing which will tend to raise the standard of concrete making to the exclusion of the irresponsible maker of concrete, either on the job or at a makeshift plant. This is not necessarily a selfish attitude but a long-range policy which should be adopted by everyone concerned with the future of the concrete industry. If the confidence of the customer is enjoyed, the every-day relation will be much more pleasant, and the number of problems which he will dump into the producer's lap will be surprising. He will ask and take advice about placing, curing, quality of concrete to use, what to do about frozen concrete, etc.

There are any number of specifications being written to-day which still call for 1-2-4 concrete, and do not even state whether these proportions are to be based on damp loose, dry loose, or dry rodded volumes. Surely much work can be done along this line alone.

Job Servicing.—The word "service" is sometimes a very hollow word, indeed, either because there is no concrete production to be serviced—a very common complaint during the past few years—or because there is more business than can possibly be handled. It is during these periods that the producer wishes bitterly that he had put his money into a grocery business or something else not quite so hard on the nervous system. Nevertheless, there are many opportunities partly to allay this strain on the nerves through intelligent job servicing.

As soon as a job is sold the salesman should report it to the service manager. If possible, he should find out the approximate date when the first delivery of concrete is desired. The service manager should visit the job at once to get acquainted with the contractor or his representative, if he is a new customer, or, if an old customer, it is wise to visit the job anyway so that he may be familiar with the particular set-up there. At this time it may be possible to suggest ways of handling the concrete and, before leaving, all pertinent information should be at hand. This can be obtained by reading the specifications and discussing with the superintendent or foreman the rate of delivery desired, etc. If competition is keen, this visit will also tend to "clinch" the sale.

Any special information about the job should be conveyed to the plant at once, and when the job calls for its first delivery, care should be taken to have a clear understanding with the man on the job as to his requirements, etc. The service manager should make it a point to be on the job when the first load arrives, if it is at all possible. This will enable him to make any changes in the consistency, to speed or slow up delivery, or to do any of the various things which might make the delivery more satisfactory.

Once the job is in progress and a complete understanding exists between the man on the job and the plant as to his particular requirements, the superintendent will usually telephone whenever he wants concrete. He should be trained to call the night before at the latest, and the plant should always find out exactly what he wishes and how to proceed under any circumstances, such as a change in the weather, etc. Once a day or oftener the service manager should visit the job, particularly if the deliveries are large and require constant supervision for maximum production. These visits are appreciated by the man on the job, if there is something to offer other than a mere "time of day." Even when no actual concreting is in progress it is well to pay a visit now and then so that close contact may be maintained at all times. In this way it is possible to develop a personal feeling which will stand the producer in good stead during the stress and strain of attempting to handle "peak" loads.

"Peak" Loads.—Even when only a normal amount of business is handled by a plant there are a number of times when the demand for concrete and the equipment for producing or delivering it are as far apart as the poles. It is not always possible to foresee these "peak" loads or to do a great deal about them when they occur. If enough facilities were provided to service adequately any demand, the operator would have so much money tied up in capital investment that he would be unable to sell his concrete at a profit in competition. About half the time he needs twice as many trucks as he owns, and the rest of the time he could probably get along with two or three units. Sometimes it is possible to get temporary relief by renting trucks from a competitor, but usually all plants will be busy at the same time. This overloading of delivery capacity—for it is here that it is most likely to take place—comes about from a variety of causes: overselling, trying to service one or more jobs with a particularly long haul, several small jobs going on at the same time plus one or more large jobs capable of absorbing most of the delivery equipment themselves. The only thing that can possibly be done when this happens is to work with the greatest efficiency possible, and to foresee these conditions as far ahead of time as possible so that the most advantageous schedule may be worked out. If a customer can not be served on a certain day, he should be told ahead of time, and while a number of customers will be unreasonable—perhaps they do not think so—it is surprising how many of them will be willing to go along if in so doing they do not greatly inconvenience themselves. Here the value of a good personal relation with the customer is important, but care should be exercised not to disappoint him once delivery has been definitely promised. One of the poorest practices possible is to take an order when delivery is out of the question and the customer is allowed to wait on the job for several hours before he is finally told that delivery can not be made. Another common mistake is to tell him when he calls that "it is on the way," when it may be an hour or so before it can be started to him.

Sometime in the future a way may be found to deal more effectively with these "peak" loads, but at present there seems to be only a "treatment" and no "cure."

Expediting Delivery.—In connection with "peak" loads it is imperative that the trucks lose no unnecessary time either at the plant or on the job. This is especially true if a small job is being served, but many large jobs with expert supervision need constant attention. The first step is to impress the superintendent with the importance of not holding a truck on the job. Hoppers should be supplied whenever possible, and in most cases the contractor is able to see the benefit to himself because their use will insure a steady supply of concrete. From the producer's standpoint they will improve delivery to the equivalent of having an extra truck on the jobs where they are used. In paving work spreaders will greatly speed unloading, but it will be a harder matter to convince the ordinary paving contractor that their use will mean money to him. If a customer persists in holding trucks when they come on the job, it may be necessary to make a charge for this waiting time. Before doing this it would be wise to take the matter up with the contractor himself, since it may be a job condition of which he is entirely ignorant. If a charge is made for truck time, it will either remedy the situation or lose a customer. In case the customer is lost it may be just as well, as the cost of serving him might amount to more than the price of the concrete. In the main, however, the attention of the service manager should be concentrated on the jobs that hold a truck only a few minutes longer than necessary, for if this can be remedied, the delivery capacity will be materially increased.

Complaints.—No business can operate without having a certain number of complaints, other than from the service it gives. In the ready-mixed-concrete industry these complaints will vary from claims of enormous shortage to cranks' attempts to prevent the use of certain streets for delivery purposes. Perhaps the most common of these is the claim of shortage, for it is natural that the man on the job will attempt to saddle any loss for which he is accountable on some one else's shoulders if possible. The writer knows of cases where the producer was blamed for honeycombing in a floor slab, and for frozen concrete; in fact, one small producer replaced some concrete which was frozen when the temperature went to 5 deg. above, and he was in no way responsible. All claims should be thoroughly investigated and immediately after they are made. If this is done and normal care is exercised in the operation of the plant, it will be a simple matter in most cases not only to avoid

(Continued on page 60)

The tug "Gene Jr." shifting a scow loaded with gravel.

Diesel-Powered Tugs Work Like Trojans . . . and at Low Cost

MUCH of New York City's sand and gravel is sold and delivered by the Colonial Sand & Gravel Co. Its subsidiary, the Goodwin-Gallagher Sand & Gravel Co. produces the material for its Long Island pits and plants at Port Washington and Northport. The Goodwin-Gallagher organization also transports the materials by water to the Colonial company's distributing yards on the New York waterfront.

It is not unusual for the company to deliver as many as 60 barge-loads of sand and gravel, each consisting of 700 cu. yd., in a single day. To handle this fleet economically the Goodwin-Gallagher concern has six Diesel-driven tugs, the flagship of which is the *Gene Pope*. Others are the *Colonial*, the *Catherine Pope*, the *F. R. Pope*, the *Wm. E. Reed*, and the *Gene, Jr.*

Twelve years ago the concern installed its first Diesel engine in one of the tugs. Now the entire fleet is equipped with Fairbanks-Morse main and auxiliary Diesels.

Operating costs per hour for fuel and lubricants on each of the six tugs, according to records kept by Port Engineer Henry Bade, are as follows:

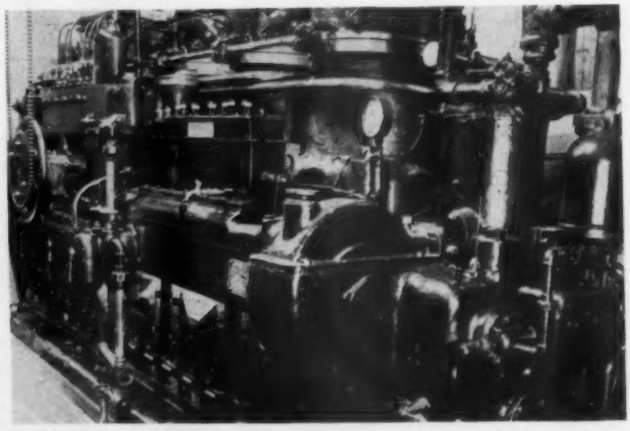
Tug	*Horsepower*	*Hourly Cost*
Gene Pope	700	$1.42
Catherine Pope	360	.85
Wm. E. Reed	240	.60
Colonial	150	.35
Gene Jr.	100	.31
F. R. Pope	60	.07

Compared with the cost of operating by steam it is interesting to note that the company kept records of a steam-operated tug, the 280-hp. *Phoenix* and the 360-hp. Diesel tug *Catherine Pope*. Over the period of a year, although the *Catherine Pope* did more work, the operating cost was but $1,930 compared with $8,281 for the *Phoenix*.

The schedule under which these tugs operate does not allow many wasted moments. The work at hand keeps each boat on the jump, which activity would be considerably slowed up if coal and water had to be loaded for steam requirements. Time lost between jobs awaiting orders does not total an hour a day on any of the tugs. Loading fuel for the Diesel engines is an hour's job, and occurs from once every 7 days on the *Colonial* to once every 45 days on the flagship *Gene Pope*. No time is lost in starting the engines—they are equally quick on the reverse, which is accomplished through centralized engine controls.

More than a thousand bells a day characterize the maneuvering needs of the fleet. A counter put on the engine-room bells of one tug registered 370 signals in a period of two hours. Naturally the Diesel engines must be in good working order, so as to respond promptly to avoid damage and unnecessary maneuvering delays. Work for the boats originates with shifter tugs, the *Gene Jr.* stationed at Port Washington where the 100-hp. engine is on the job 24 hr. a day, and at Northport where a 60-hp. Diesel in the *F. R. Pope* does the work for the small sum of 7 c. an hr. These tugs put the empty scows into the loading docks, remove the loaded ones to the stake boat and occasionally make deliveries across the Sound. From this point on, activities center around the flagship *Gene Pope*, which usually makes the long hauls. It picks up as many as 29 or 30 loaded scows from Northport and Port Washington and tows them to the stake boat off College Point. In between runs this tug is employed for river and harbor work. Deliveries to distributing stations are made from this point by the smaller Diesel tugs, *Catherine Pope*, *Wm. E. Reed* and *Colonial*.

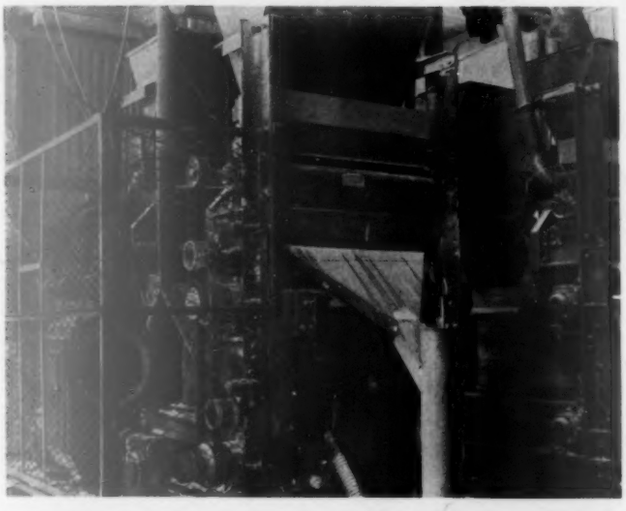
The "Colonial"—one of the busy tugboats.



The 6-cyl. Diesel engine in the "Colonial."

ADDS EQUIPMENT TO INCREASE OUTPUT

ABOVE — General view of Erwin Feldspar Co. plant, Erwin, Tenn., showing raw-material shed in foreground.



The dual-induction magnetic separator. Four of these units were installed this year.

Inclosure and dust-collector connection at one of the vibrating screens.

FOLLOWING its policy of keeping all its plants at peak efficiency and its products in line with market demands the Consolidated Feldspar Corp., Trenton, N. J., has in recent years made many important improvements in its various plants. The latest step in this program was recently completed at the plant of the Erwin Feldspar Co., a subsidiary, at Erwin, Tenn. Improvements at this plant, which have been under way for several years, involved a rebuilding of the crushing and screening departments and included the installation of considerable new crushing and screen-equipment. New magnetic-separating and dust-collecting equipment was also added. These improvements have not added greatly to the capacity of the plant but have made it possible to produce a wide variety of the higher grades of ground spar for which there is a growing demand.

Outside the improvements mentioned above the remainder of the plant remains as it was when a complete description was published in the March 23, 1932 issue of PIT AND QUARRY. This article was published shortly after the completion of a rebuilding and enlarging program which made this plant one of the outstanding operations in the feldspar industry. Because of the completeness of this previous description the present article will describe only briefly the various operations which remain unchanged.

Crude spar is obtained mainly from the company's mines in North Carolina, although a small part of its requirements is purchased, and is shipped to the plant in box cars. Some selection of the spar is made at the mines and a further selection is made when it is unloaded at the plant into the extensive storage sheds. Primary reduction of the spar is done in a 24-in. by 30-in. Reliance jaw crusher which reduces the material to 2½-in. size and under. An elevator discharges the crushed material on a Jeffrey-Traylor 2-deck electric vibrating screen having 4- and 10-mesh cloth. Material retained on both decks is chuted to two 3-ft. Symons short-head cone crushers whose product is returned to the screen on the elevator mentioned. These crushers replaced a single 4-ft. cone crusher and were installed to get greater crushing capacity and to allow

OF GROUND SPAR

operations to continue should one of the crushers go out of service for any reason. Sometimes only part of the plant's crushing capacity is required and only one crusher is then operated with a resultant saving in power and maintenance costs.

The minus 10-mesh material passing through the bottom deck of the screen is fed to a second bucket-elevator which discharges through a split chute to two Jeffrey-Traylor single-deck screens. These are fitted with 20-mesh wire cloth and are fully inclosed with connections to a dust-collector.

Ordinarily the 10- to 20-mesh material retained on these screens is fed by Weller screw-conveyors to two of the four Exolon double magnetic separators whose installation was completed early this year. These separators reduce the iron content of the spar from .08 per cent. to from .05 to .06 per cent. and also remove some of the small amount of mica, garnet and tourmaline found in it. The separator product then passes through a cutting sampler of the company's own design before it goes to storage.

The minus 20-mesh material passing through the bottom decks of these screens can be fed by screw conveyors to the other two Exolon separators and to storage. This material can also go to a Tyler 400 single-deck screen with 60-mesh wire cloth. Material retained on this screen goes to the Exolon separators and to storage. The material passing through this screen is fed with the 10- to 20-mesh material to the first-mentioned dual separators.

Forward from this point in the flow the plan has been changed only in minor details since the last description was published. The various grades of spar are sampled at regular intervals before they are conveyed to the thirty 70-ton cylindrical steel crude-spar storage bins arranged in two rows of 15 bins each. Each bin contains a distinct grade of spar so that, with the analysis of each bin available, any desired chemical or mineralogical blend can be made from these bins. Usually 8 bins are used for the finished granular spar, which is taken direct from the bins for the glass trade.

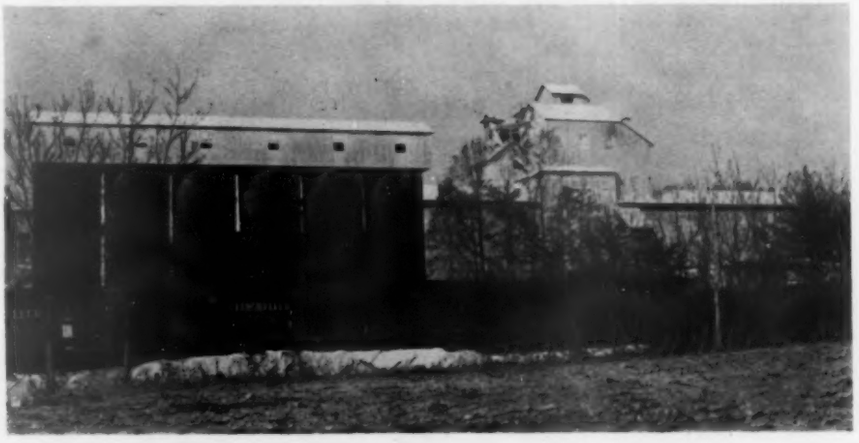
Blending of the spar for the grinding plant is done by means of volumetric measuring boxes or conveying weighers

Four-unit dust-collector which is connected to the crushing, screening and grinding equipment.

Blower drive and controls above the dust-collecting equipment pictured above.

Double-deck electric vibrating screen which makes the primary separation.

BELOW—Another view of the plant with finished-material storage silos at the left.



Close-up view of one of the magnetic separators showing energizing coil and other details.

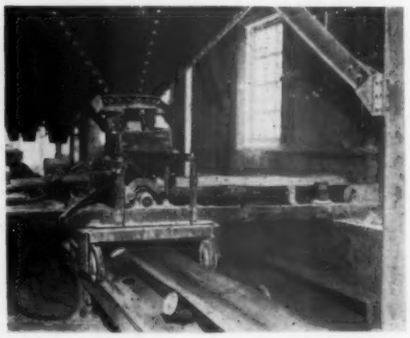
of the company's own design under these bins. As stated in the previous article, belt-conveyors and elevators carry the blended spar to four 40-ton head bins, one over each of the four batteries of grinding mills. These bins make the blending and conveying system entirely independent of the grinding, as any blend can be fed to any of the four bins whether all or any number of the four batteries of mills are operating. Only enough description of the grinding equipment is included in this article to give the reader some idea of the lengths to which the company has gone

Another of the vibrating screens after it was completely inclosed and connected to the dust-collector.

to insure absolute control of the finished product.

Flow No. 1 utilizes two 8-ft. by 30-in. Hardinge conical-mills whose product is elevated to a Tyler Hum-mer screen equipped with 40-mesh wire cloth. Coarse material from this screen is passed through a 5-ft. by 22-ft. tube-mill for further reduction. The product of this mill, with the undersize from the screen, goes to two 12-ft. Gayco mechanical separators operating in series. The material rejected by the separators goes back to the last-mentioned tube-mill. The separator product can go either to storage or direct to cars for shipment. With this system any desired product finer than 120-mesh can be produced. Usually a ground feldspar, of which 99.8 per cent. will pass 200-mesh, is produced for the pottery, soap and enamel industries.

In Flow No. 2 the spar is discharged from the head bin into a 30-in. by 8-ft. Hardinge conical mill. A Tyler Hummer screen fitted with 40-mesh cloth returns the coarse material to the mill. The finished product passing through the screen goes either to storage or to



Conveying weigher beneath one of the 30 storage tanks loading to cars. Conveyor below feeds to grinding department.

cars. This product goes to either the glass or the enamel industries.

In Flow No. 3 the spar is fed from the bin to a 48-in. by 8-ft. Hardinge conical mill, which operates in closed circuit with a Tyler Hum-mer screen having 20-mesh cloth. This product is used for glass-making only.

In Flow No. 4 the bin feeds the spar to a 28-in. by 10-ft. Hardinge conical mill, whose product goes to a 40-mesh Hummer screen operating in closed circuit. The material passing through the screen goes to a 14-ft. Sturtevant separator whose rejects are also returned to

One of the two 3-ft. short-head cone crushers which replaced a single and larger unit.

the mill. The separator product, which is about 98 per cent. through 200-mesh, is sold as potters' flint.

In each of these flows the product is handled by conveyors and elevators to the six 300-ton loading bins.

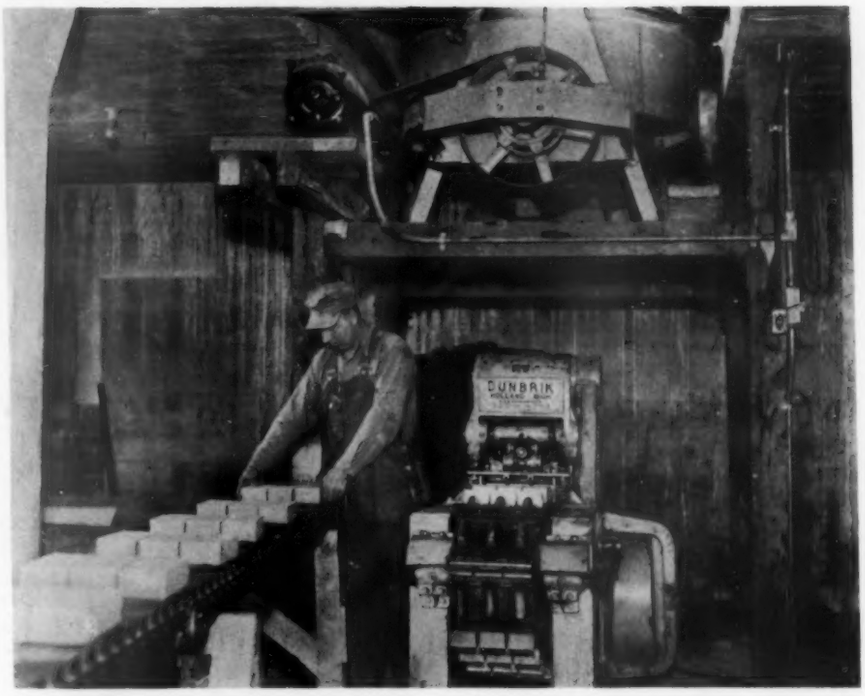
An old cyclone which was formerly connected to equipment in the plant has been replaced by a Northern Blower Co. "Norblo" 4-unit dust-collector. This is now connected only to the crushing and screening departments but will later be connected to the mill department as well. This collector has a size 50 exhaust fan which is driven through Manhattan "Condor" V-belt by a 25-hp. G. E. motor mounted on a Browning pivoted motor base. Electric energy for the four Exolon dual-induction magnetic separators used in this plant is produced by two Electrical Specialty Co. rotary converters fitted with Ward Leonard controls.

Ready-Mixed Concrete

(*from page 56*)

any loss from this source, but also to convince the customer that the so-called shortage was not due to any mistake of the producer. One producer has adopted a policy of furnishing about 30 cu. ft. for a cu. yd. of concrete, but this is a great mistake and should never be done. On the other hand, the writer knows of a case where a customer has claimed a shortage for at least a dozen times and in every case he had been shown and convinced that no shortage existed. This does not, however, seem to deter him or jeopard his business, as this last claim was fairly recent. Most of these particular claims arise from sloppy measurement or calculation.

The ready-mixed-concrete industry can not expect to become a stable industry unless it can standardize its methods and its product. The only justification for the existence of the industry is that it is capable of furnishing a superior product from the standpoint of quality, uniformity, service, and, lastly, price. The opportunity is at hand, the equipment and facilities are adequate and available, and it remains for the operator to make the most of it. No businessman can expect to remain in a competitive business if he does not furnish a superior product, even if he can not ask a premium for it, and if there was ever a competitive business, ready-mixed-concrete is it. At the same time it offers one of the few remaining chances for success based on individual effort and ingenuity.



RIGHT — The brick-making machine at the Rider plant, with mixer above and roller conveyor for finished units at the left.

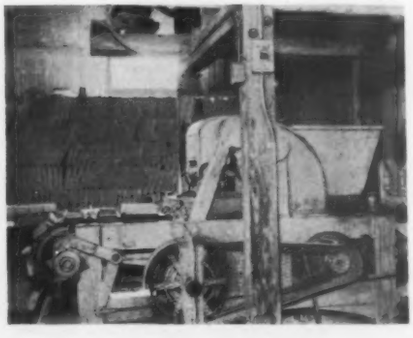
New York Gravel Operator Finds Concrete-Brick Production Pays

ONE result of the recent years of depressed business conditions has been a growing realization by aggregates producers of the necessity for finding new outlets for their materials. This has resulted in the installation by a rapidly-increasing number of producers of facilities for the manufacture of various products in which their aggregates are utilized. In many cases this step has brought about the utilization of sizes of aggregates formerly wasted. In other cases it has meant the regaining of outlets for aggregates which had been lost to other producers who had earlier installed such facilities. Among the products whose manufacture by aggregates producers is rapidly growing are concrete brick, block and tile, bituminized aggregates, ready-mixed concrete and calcium- and sodium-chloride aggregate mixtures.

Among the many aggregates producers who have found it profitable to enter into such sidelines is F. A. Rider, Inc., Endicott, N. Y. This firm has been a producer of sand and gravel since 1925 and early in 1936 installed equipment for the manufacture of concrete and ashlar bricks in single, double or triple form, either plain or colored. The equipment used was furnished by the W. E. Dunn Mfg. Co., Holland, Mich., and the product is Dunbrik, a patented masonry building unit which can be made at the rate of 1,800 standard bricks per hr.

According to F. A. Rider, president and general manager of this company, this product was new in this territory where local clay-brick manufacturers formerly enjoyed a monopoly. For this reason an educational as well as selling job was necessary in getting started in this new field. Once introduced, said Mr. Rider, this product practically sells itself because of its advantages over clay bricks, these including higher compressive strength, lower absorption and its lighter weight about equivalent to 1 lb. per brick. Dunbrik can also compete with clay brick on a price basis, according to Mr. Rider, as it can be made at a lower cost. The sales volume has been satisfactory and is growing rapidly with the increase in private building construction in this vicinity. Some orders are also being received for ashlar brick.

This Dunbrik plant is installed in a concrete building which is near the aggregate plant and will later be the basement of a truck garage and repair shop. Uncrushed ½-in. gravel and sand are batched and hauled in trucks to this plant, where they are dumped into the 16-cu. ft. Dunn blade mixer with the cement and water. The concrete is then discharged through a chute into the Dunbrik machine from which the finished bricks are taken to a gravity roller-conveyor and stacked in racks for air-drying. From 30,000 to 60,000 bricks are kept on hand at all times. Dried bricks to be colored are stacked in wall form and are sprayed by a Dunn spray gun which also mixes the desired colors. The Dunbrik machine is an automatic, straight-line, continuous-production unit in which the only manual operations required are control of the feeding of concrete to the mixer and the removal of the finished bricks to the conveyor.



Another view of the brick machine with receiving hopper at right.

Looking into the blade-mixer where the concrete is prepared.

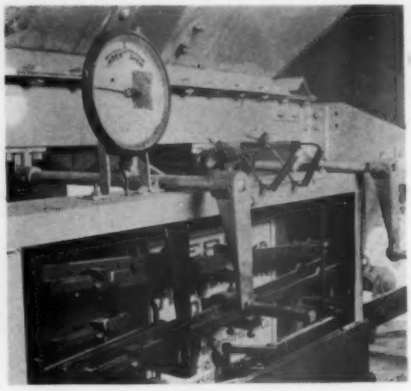
Workman spraying color on the faces of the bricks.

The sand-and-gravel plant which supplies materials for the brick plant was built in 1930 and has a daily capacity of 1,500 tons of sand, gravel and crushed gravel. The plant and deposit are located on the south side of the Susquehanna River, about 5 mi. west of Binghamton, N. Y. The deposit is of

Batching plant which proportions materials for road construction.

glacial origin and contains quartz, sandstone and limestone. It is estimated to contain sufficient material for 50 years' operation. A steam shovel loads the material into trucks which discharge it on a series of 3 field conveyors totaling 575 ft. in length. Scalping is done by a Niagara vibrating screen and material over 2 in. in size is fed to a Good Roads jaw crusher. The 1½- to 2-in. material from this screen goes to a 2-ft. Symons cone crusher. All the crushed material is then elevated to a revolving screen which separates it into four sizes. These are stored in a 400-ton capacity bin.

The minus 1½-in. uncrushed gravel and sand from the scalping screen is



Weighing equipment in the road-material batching plant.

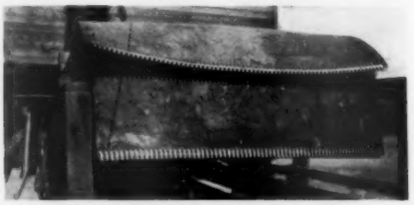
fed by a belt-conveyor to another revolving screen which produces 3 sizes of gravel. Sand is passed through a drag-box and a Telsmith single-screw washer. Bins for storing the sand and uncrushed gravel have a total capacity of 1,800 tons. Any dust from the crushed-gravel plant is added to the sand.

About three years ago an Erie Aggremeter batching plant was installed to batch materials for concrete-road construction. This has a 150-ton bin and a 3-compartment Erie weighing batcher. About 60 per cent. of the material produced is crushed and about 90 per cent. of the total production is shipped by motor trucks.

A general view of the sand-and-gravel plant of F. A. Rider, Inc.

Belt Fasteners Save Expensive Replacement

At Grand Coulee Dam, where now runs the largest conveyorized construction project in the world, a remarkable saving in belting replacements has been effected by Conveyor Superintendent John Cunning, for the contractors, Mason-Walsh-Atkinson-Kier Co.



How sections are inserted to advance the stacker belt.

The large conveyor is more than a mile in length and contains 22 belts, which run at a high speed of from 600 to 640 ft. per min. The belts are 8-ply, 60 in. in width and are surfaced with rubber 3/16 in. thick. The material handled is glacial moraine — rocks, stones, and damp brown earth—which is dropped on the apron feeders through a grizzly that bars rocks of more than 16 in. in smallest diameter. The material is elevated 325 ft. before it leaves

Repair of this long rip saved replacement of belting at $15 per ft.

the stacker. Between belts there are drops of from 5 to 9 ft. Breaking the full force of the drops, however, free swinging hooks are suspended in the way of the bounding rocks.

The conveyor has handled over 50,000 cu.yd. of material in a 21-hr. shift, and a total of between 12,000,000 and 14,000,000 cu.yd.

Eight belts have been ripped from end to end by snagged rocks. Where this has occurred, or where rocks have beaten holes through the belts or caused rips of various lengths, the belts have been patched and sides of the ripped belt joined together, and service resumed.

The company achieved these worthwhile savings (on belting costing in ex-

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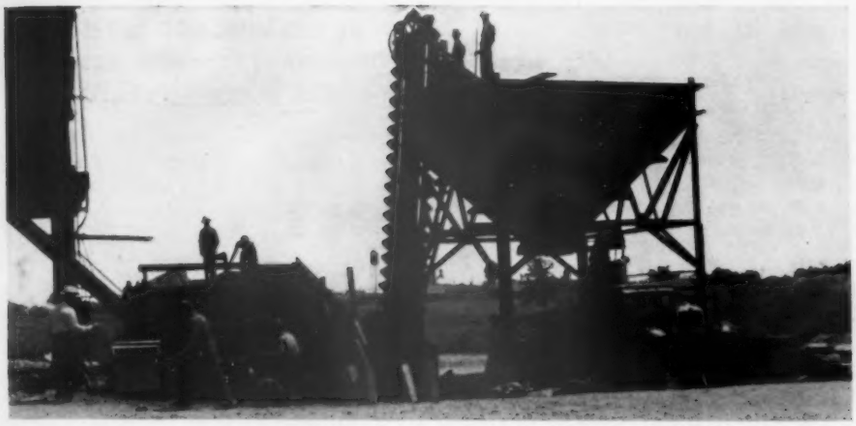


LEFT — Stabilized-mix plant of the Ray Sand & Gravel Co., Oxford, Mich.

BELOW—The feeder which controls the amount of clay fed to the pug-mill.

Michigan Gravel Firm Takes Advantage of Demand for Stabilized Road Material

A PLANT for the production of stabilized soil-aggregate mixture is the newest addition to the Oxford, Mich., plant of the Ray Sand & Gravel Co., Detroit. The Ray company recognized and has taken advantage of the local demand for stabilized aggregate and is successfully producing accurately proportioned material for road surfacing and base-course construction formerly taken from roadside pits and built by force account.

The stabilization plant was installed at the opening of this season and, while no great amount of money was involved in its construction, it is operating efficiently and economically at a capacity of 40 tons of stabilized mix per hr.

An abundance of suitable sand-clay binder soil was located in close proximity to the gravel plant and it was found by tests that a stabilized mix of proper gradation could be produced by using 7½ per cent. of ½-in. gravel, 42½ per cent. of birdseye (0.25-in. to 0.10-in.) gravel, and 50 per cent. sand-clay topsoil. To these ingredients are added calcium chloride at the rate of 12 lb. to the cu. yd. of mix, and water in sufficient amount to produce ready compaction when spread, as specified by the engineer in charge.

The gravel is fed directly into the pug-mill through a chute from a 70-cu.yd. gravel hopper, and the flow is controlled by a gate feed. The sand-clay is dumped directly into a hopper mounted above a screw-type feeder which controls delivery to the pug-mill. The calcium chloride is added to the mixture from a hopper located above the pug-mill, and the water through a sprinkler pipe running lengthwise of the pug-mill.

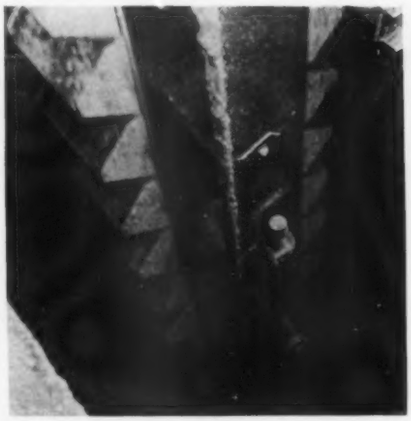
After thorough mixing in the pug-mill (4 ft. wide by 16 ft. long) the material is emptied into a bucket-elevator which takes the finished mixture to the 50-cu-yd. loading bin. There it is dumped into trucks and hauled to the road.

The pug-mill is driven by a 50-hp. motor, while the clay feeder and bucket-elevator are driven by 10-hp. motors.

In addition to the designed stabilized mixture which is being furnished largely for the Oakland County Road Commission, the Ray Sand & Gravel Co. has been producing material under Michigan State Highway Specifications No. 21-A, which includes gravel, binder-soil and calcium chloride. This latter material is used by the state highway department in the construction of base course for oil-aggregate surfacing.

Since its introduction four years ago stabilization has passed from the experimental to the practical stage and is rapidly becoming standard practice among highway engineers in all sections of the country. Unquestionably future highway construction will include more and more calcium-chloride-stabilized roads, for use both as wearing courses and bases for higher-type surfacing. Plant-mixed material is usually more uniform than that produced by the road-mixed method, less equipment is required on the road, and there is less dependence on weather conditions. Consequently highway engineers are expressing a preference for plant-mixed stabilized material, which offers an extensive new market for aggregates producers who are equipped to meet the demand.

ABOVE—The pug-mill, with water-supply pipe. BELOW—The bucket-elevator which carries the stabilized mixture to the loading bin.



By DR. WILLARD L. THORP
Director of Economic Research,
Dun & Bradstreet, Inc.

The Probable Economic Effect of the Robinson-Patman Act*

First citations by the Federal Trade Commission for violations of the Robinson-Patman Act were issued Sept. 30 against Montgomery, Ward & Co., and the Kraft-Phenix Cheese Corp. The former was charged with "knowingly to induce or receive a discrimination in price" in transactions involving the purchase by the mail-order concern of floor coverings at prices lower than those quoted to independent dealers. The Kraft-Phenix firm is alleged to have sold its products to different customers at different prices in violation of the act. Both cases are regarded merely as tests of the new law and the outcome will be awaited with interest.

ONE could dismiss the probable effects of the Robinson-Patman Act by arguing that the law, either for legal or practical reasons, will never be effective. But the influence of a law can not be measured by court decrees. Its impact may be better measured by the extent to which adjustments in business policies are set in motion which render court action quite unnecessary.

Laws do not beget themselves. They are written on the statute books "with intent." This particular law was no sudden conception. Various business interests had agitated for some such legislation for years. The Robinson-Patman Act is the current expression of certain ancient and deep-seated human conflicts. Whatever happens to this particular act, the circumstances and forces that gave it birth are likely to persist. It was foreshadowed in various N.R.A. codes and controversies. More recently considerable evidence was accumulated in Congressional hearings. And perhaps too many members of Congress participated actively in developing the final form taken by the legislation. This widespread interest and concern indicates that the problems dealt with were believed by many to be of vital importance and of their hope that some solution would result in an improved economic system.

To discuss the probable effect of the act on business behavior is more than a matter of forecasting action by the Federal Trade Commission and the courts. To be sure, to a considerable extent, an umpire defines the rules of any game. But the attitude and behavior of the players and the public is far more important. The long-run effect of this act is not to be measured in the number of players sent to the side-lines by the umpire, but rather in changes in behavior on the playing field. And these will depend less upon the exact phraseology of the act than upon its general purpose and intent. Already, although none of the many legal problems have been settled, there are reports of important changes in industry practice, which can only be attributed to the fact that this act is on the statute books. Many of the players are using the new rules, even though the umpire has not yet reached the field.

This act is a reaction to basic competitive relationships which have taken on new aspects under the impact of the depression. Very real problems are there. The failure of this particular law will not solve them. They would still remain and other efforts would be made to deal with them. So it seems reasonable to give some thought to the act in terms of its significance to our economic structure. And if the act is bewildering and confusing in many of its legal aspects, it seems fairly clear in some of its broader economic implications and intentions.

Among other things the act (and my discussion is limited to the Robinson-Patman Act amending the Clayton Act and not the Borah-Van Nuys section) concerns itself with cases where products of like grade and quality are sold by some one to different purchasers at different prices. Competition must exist somewhere with the seller, the purchasers, or the purchaser's customers. The price differential is unlawful if the result is to tend to create a monopoly or substantially to lessen competition, either in general or on the part of some one of the competitors involved. However, even in the face of such result, the price discrimination becomes a permissible differential when:

(a) It is quantity discount not exceeding the difference in cost of manufacture, sale or delivery.

(b) It relates to a different method of operation or dealing and does not exceed the resulting difference in cost of manufacture, sale or delivery.

(c) It represents a price change in response to changing market conditions.

(d) It involves services or allowances which are available in equal proportions to all purchasers.

However, no defense is adequate if there are so few buyers that monopoly is being promoted, and in such cases limits on quantity discount may be established by the Federal Trade Commission.

According to the House Committee on Judiciary Report,

"It is the design and intent of this bill to strengthen existing anti-trust laws, prevent unfair price discriminations, and preserve competition in interstate commerce. It is believed to be in the interest of producer, consumer and distributor. No business institution need have any fear of this legislation if it will conduct its business honestly and without the use of unfair trade practices, and unjust price discriminations."

So we have the act and an official statement of its "design and intent." Let us speculate about its effects in three general areas:

(1) Internal business operations.
(2) Price structures.
(3) Industry structure.

* Abstract from a paper read at the Robinson-Patman Conference of Trade Assn. Executives at New York, N. Y.

To make any analysis at all from the economic point of view, I must assume a sincere and widespread effort to follow the principles and accomplish the intentions of the act. To what extent this assumption must eventually be qualified in terms of legal limitations, business opposition or frailty in the act itself I must leave to your own judgment and the advice of counsel.

Internal Business Operations.—The outstanding effect of the act on the internal operation of an enterprise is the necessity established to keep detailed and elaborate records of cost, if price differentials or discounts are to be employed. No Washington commentator has ever suggested that any lobbyist representing the certified public accountants actively supported the bill. Nevertheless, those white-collar workers, the bookkeepers and accountants, will be among the act's chief beneficiaries.

Manufacturers and distributors employing price differentials must be prepared to demonstrate that they have made "only due allowance for differences in the cost of manufacture, sale, or delivery resulting from the differing methods or quantities in which such commodities are to such purchasers sold or delivered." Thus cost is established as the standard for determining the maximum differentials permitted.

To the uninitiated the determination of these costs may appear to be a matter of no great difficulty. In fact, it bristles with problems both of technique and of principle. Many progressive enterprises have developed cost-accounting systems for factory costs, but even these are usually in terms of general averages, frequently not broken down in detail by products, and almost never kept on a basis of purchaser's orders. In but few cases are they developed in terms of the costs involved for various quantities which may go through the manufacturing process. In enterprises which produce many products of differing grade and quality, the determination of specific product factory costs will be of no slight difficulty.

But the problem of costs of manufacture is simple compared with the measurement of the differential costs of sale. Where different methods of selling are involved, where single expenditures such as salesman's travel account, represent efforts to sell various products to various customers, the isolation of cost of sale of particular products to particular customers will certainly tax the accountant's ingenuity. Undoubtedly much more detailed basic records of time and cost expenditures will need to be kept as raw material for developing the specific cost figures required by the act.

The Goodyear case, with all its problems, was relatively simple as compared to the cost problem faced by some enterprises. It took only two years to hear and 25,000 pages to record. Nevertheless, it can be of considerable help by indicating the attitude of the Federal Trade Commission on some of the problems inevitably raised by the effort to measure differential costs.

A. Since the discrimination charged was between Goodyear sales to dealers and to Sears-Roebuck, other channels of distribution were eliminated from the calculations, *i.e.,* Goodyear's sales through its own stores and its bus and taxi mileage business. This elimination was not accomplished, however, without a strenuous fight, inasmuch as these other outlets had incurred a loss which, if charged in any part to dealer channels, would have reduced the amount of alleged discrimination.

B. Costs were computed both by tracing the prices and costs of eight specific tires, and by constructing complete profit and loss statements for both channels. The same basic data were required for both calculations, the different results arising not so much from different types of cost data as from the fact that certain specific transactions were examined to obtain specific tire data, while all pertinent transactions were reflected in the profit and loss statement analysis.

C. Advertising and selling expenses were charged entirely against the dealers, although there was considerable argument on the point. Had Sears-Roebuck clearly taken advantage of the Goodyear name, or sold Goodyear brands, this important item would unquestionably have been treated differently.

D. Administrative Expense was prorated impartially over all tire units passing through the factory. This principle appears to be that followed by the Congressional sponsors of the act.

E. Any benefits of quantity not directly reflected in cost were excluded from consideration. This also seems to be the purpose of Congress. The Senate Committee on Judiciary, for example, was explicit on the point that "no particular customer should be permitted distinctively to claim the benefit, nor required distinctively to bear the burden, of the immediate use or non-use of facilities which the seller must maintain for his business generally."

The necessity which the act places upon industry to examine carefully the costs applicable to various transactions may prove a burden, but it is a burden not without recompense. Experts have long argued that most enterprises carry on a considerable part of their business at a loss, and that some reduction in volume, if wisely directed, would increase the profit.

Price Structures.—The immediate impact of the law falls upon the price structure. To see the requirements of the act more clearly let us consider the most complicated case—a manufacturer selling many products to many customers. This act does not put his entire price structure in order, but concerns itself with order within various subdivisions defined by particular products and markets. For each manufacturer, therefore, there are those areas in his price structure in which:

(1) More than one price exists for particular products of like grade and quality.

(2) The several prices apply to purchasers who compete with the seller, with each other, or with each other's customers in the use or resale of the product.

The law does not affect the price relationship among the various different products which a man sells, as for example, fly swatters and fly paper. It does not affect the relationship between prices to customers whose disposition of the product will not be in or lead to competition. The relationship between prices of flashlight batteries to toy manufacturers and to variety chains is not involved. Battery prices to various toy manufacturers must be orderly; and prices to various chains must be orderly; but each is a separate area and there is no necessary relationship between them. Sales to manufacturers for use in remanufacture might thus have a price structure quite apart from that applying to channels for consumer distribution. Thus, most sales to the government would not seem to be involved, and the act excludes export trade by definition.

Within each product-market area prices to all customers must be alike, except as differences are justified according to quantity or method of doing business. This is intended to be a death sentence to sale by individual bargain, in which each customer is dealt with separately and according to mood and tense. The hope is to rid business of unwarranted special concessions, to assure equivalent prices to all customers of like grade and quality.

Obviously this idea can not be obtained unless by "price" one means all the considerations which go into the computation of a net price—the various discounts, allowances, and payments for special services and facilities. In the past these other considerations have provided the method whereby extra concessions are made to favored buyers. Limited adjustments for differing methods and quantities are permitted. The principle for other elements in the price contract seems to me clear; if such special considerations are real, they must be made available "in proportionately equal terms to all other customers com-

peting"; if they are merely camouflaged price-cuts, they have no place in the price structure.

This act, therefore, looks in the direction of a price structure of the type of a single list price with various discounts, discounts either having some semblance to cost or less (in the case of quantity or different methods), or being uniform at some reasonable level (as cash discount, guarantee against price decline, and the like).

While this uniformity of treatment may prove to be the outstanding development in industries with disorganized price structures, many others have operated under an orderly price structure for years. In such cases the act can do no more than modify the existing rates, if that. Frequently, where existing discount practices have grown up under the influence of strong bargaining power on the part of certain buyers, the result has been that large purchasers have obtained concessions which can not be justified according to the criteria established by the law. The threat by the seller to take his large order to a competitor and the importance of these large orders to the seller have been sufficient to create wide differentials. With all suppliers limited by their new legal obligations the result will undoubtedly be some reduction in existing differentials in some industries.

Sec. 2(c) of the act limits the payment or receipt of commissions and brokerage to compensation by the buyer or seller for services rendered the buyer or the seller concerned. Thus, the payment of brokerage by a seller to an agent of the buyer is forbidden and *vice versa*. This section is aimed at the alleged abuse of the brokerage discount, whereby a large purchaser buying directly or through a dummy agency, exacts payment of brokerage by the seller even though no true brokerage function has been rendered to him.

Among the innumerable subjects of discussion begotten by the act, is the question of whether adjustments will be made by advancing the lower prices in the structure or dropping the higher ones.

If there is any simple guide, it is in the recent price trend and strength of the particular market in question. If prices have been rising and the market is strong, one might expect an upward adjustment of the lower prices; if weak, the adjustment will probably have to be downward in the higher prices. In the long-run the average price level will be affected only as the act leads to more or less efficiency in economic operation. There is no reason to expect that in most industries, after the initial period of adjustment, the average price under a condition of narrower differentials will behave any differently from a similar average under wider differentials. The price structure in both instances will move up or down according to the character of the industry and conditions in the market.

In one other respect the present situation may be altered. These new differentials or discounts will be determined with some care at some point not greater than the cost differences. Once established, they will be slow to change.

In many industries the practice has grown up for the list price to be much more fixed than the various discounts. Modifications in price have been made in the discount structure to meet some particular situation rather than by changes in list price affecting all buyers. In the future price changes in some industries may put more emphasis on the actual list price and less on the discounts.

To carry the logic to its ultimate conclusions discounts probably ought to be expressed in dollar terms rather than percentages, since the standards are based on cost. These costs would not necessarily vary in direct proportion to the base price of the product. Thus, a discount based upon the provision of warehousing facilities, would be limited by the cost of performing that function. This cost might remain fixed, so that a wide gap would develop between any fixed percentage discount and to the permissible limit, as the price of the product changed.

Parenthetically, may I make two brief observations about the quantity-differential situation as it now stands? The first is to note that, inasmuch as the law does not require any differential at all and to the extent that new differentials are below the maximum established by law, due to fear of the law or other reasons, a new form of price discrimination may conceivably emerge, one in which the large buyer does not receive the differential to which he is entitled by economies produced.

A second point: By focusing attention on the costs or economies arising from the scale of purchase a principle long enunciated by efficiency experts will be brought home, that the extremely small transaction is a very high cost transaction. In some industries these small sales are already subject to penalty although not always in proportion to actual expense. While the act does not directly bear on this type of transaction, it may indirectly have its influence in modifying the treatment given both these classes of most favored buyers, the very small or those of any size buying in Lilliputian quantities as well as the very large. Another group of customers who may find themselves unpleasantly in the limelight by cost analysis are those in scattered territories.

A special problem arises where long-term contracts enter into the price structure. The Goodyear case is of some help here. The test applied by the Federal Trade Commission was the actual operation of the contract over a period of years. That it might have been equitable when originally signed was not considered as a defense. It was judged on the basis of performance. This particular precedent indicates that, while long-term contracts are not outlawed, they can not provide a justification for price discrimination which may develop later if other less-fixed elements change in the competitive situation. In the same way other methods of sale, such as the use of quantity discounts on the basis of annual sales, are not outlawed, but they will have to stand the test of actual performance.

One most important implication in this area is the impetus it will give to price publicity. One might almost say that the act gives the purchaser the right to know the price structure of the seller. If such knowledge is refused him and he suspects unfair practices, he can apply to the Federal Trade Commission for aid, and if he can show some grounds for his suspicions, the information can be obtained by legal processes. The wise company in self defense will probably move in the direction of published prices either individually or as part of a price-filing plan. In the Goodyear case the Federal Trade Commission was particularly disturbed by the secrecy which it felt surrounded certain aspects of the deal. Certainly a publicly-announced price structure will be a strong weapon of defense for the company endeavoring to meet the requirements of the law.

Industry Structure.—The Robinson-Patman Act has often been described as anti-chain legislation. Undoubtedly in the minds of many it is significant primarily in its attempt to end undue concessions given to large buyers.

But various possible developments in some cases may offer a partial avenue of escape. The first is the possibility of so differentiating products that they will no longer be regarded as of the same grade and quality. Most products do not have the uniformity of sugar or salt. With a vivid imagination, one could evolve a scheme of classification of men's shorts which would easily include 100,000 differing grades and qualities. Of course, the sensible test is one of the immediacy of competition. The problem becomes more acute in connection with private brands. Again the sensible procedure will be to consider consumer acceptance. I suspect that various quarts of rye whisky of less than one year of age can not be made non-competitive by fixing different labels on the bottles. This is a nice legal prob-

lem. However, practically speaking, it is an ignorant manufacturer indeed who does not know who his competitors are, or which of his own products are competitive. Literal and limited interpretation of this phrase would greatly weaken the act.

A second method of avoiding the operation of the act which has been suggested is for distributors to acquire manufacturing plants, or contract for an entire plant's output, so that the product does not enter into but the single channel. This has always been possible and has developed on a small scale. But there is little reason to expect that the plant would be operated more efficiently, although there might be slight savings in selling expense. Under the act the large purchaser is permitted to receive all economies properly arising because of his size. What other economies can be anticipated by independent operation? Obviously it would be an unwise investment of capital unless it can earn a proper return. If the manufacturer was enabled to give excessive discounts to large buyers before, as alleged by some, by loading all the overhead on the small purchasers, then the single large order could not be produced independently at the original price. I can not find strong reasons for believing that any considerable trend in the direction of vertical integration will emerge, although it may tip the scales in some borderline cases.

I think the various prophecies concerning reorganized channels of distribution have greatly exaggerated the probable changes which may be attributed to the act. Of course, the whole distributive structure is in something of a state of flux. Only over a period of time, as each manufacturer and distributor studies his prices and costs more carefully, will any new trend become evident. And that trend might very possibly, regardless of any immediate distortions resulting from a laying on of the literal language of the law, be in the direction of an efficient economic evolution because it is based upon knowledge rather than guess work.

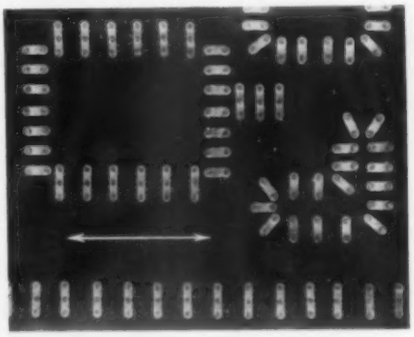
Conclusion.—One sometimes wonders how our economic system operates at all. There is no Five-year Plan to define what should be produced, no regulating body which determines who shall engage in business, or how much each shall produce. Our hope for economic progress has been placed in the belief that improved products and more efficient methods will win in the economic struggle. We have entrusted the vast problem of economic direction and control to the force of competition working through the price system. How well our system functions is determined in the last analysis by how effectively competition operates, and how sensitive the price system is to conditions in the market place.

In the past we have found it necessary from time to time to strengthen the functioning of these forces. When industrial combinations threatened our competitive system, the Sherman Act was passed to deal with these disturbing factors. On the other hand, to keep competition within proper limits the Clayton Act and the Federal Trade Commission Act were passed. The Robinson-Patman Act is the latest addition to the list. It will undoubtedly have some direct influence on business practices, but probably not as great as the sponsors hoped nor as extensive as I have outlined above. It will, of course, be limited by the definition of "commerce" and by the necessity for demonstrating that competition is substantially lessened or that monopoly is promoted. But its long-run effect, provided it leaps its legal hurdles, may come chiefly from its insistence upon greater knowledge—knowledge of costs and knowledge of prices. I am speaking now not in praise or defense of this exact law, but with respect to a possible by-product of this kind of law. If the law is good, a better knowledge of costs will supplement its value. If it is wrong, or its technical faults are too abysmal, such a development might prove a backhanded sort of compensation that we could accept with a wry face, but nevertheless accept. As matters now stand business policies are all too frequently formulated on the basis of guess work. We are inclined to insist that our judgments, once made, are right. But now business must face some specific questions concerning price structures and concerning channels of distribution. They are questions which should be asked, law or no law.

Conveyor Belt *(from page 62)*

cess of $10.00 per ft.) by employing Flexco HD belt fasteners. In fact, at Mr. Cunning's suggestion, the manufacturers have recently produced the Flexco Rip Plate. The new rip plate was worked out as the result of an attempt by Mr. Cunning to get a longer grip on the belt in repairing rips. First, he used two sets of the regular fasteners with only three bolts, overlapping one fastener on the other, and joining both sets of plates together in the rip. Then, fastening the outer ends into the belt, he had the full length of each fastener as an extra protection against the cross strains of the rip. The new rip plate carried this same advantage without the awkward overlapping.

Patches in the belts are cut in rectangular shape, the sides parallel with the sides of the belt and are held in place with the fasteners. It is advisable to round the four corners of the patch and hole, leaving space for a diagonal fastener on each corner. In attaching the



How the rip and standard fasteners are used in making repairs.

patch the fasteners are spaced closely on the width of the belt and a space of about 3 in. is left between them on the length. Patches must always be rectangular or L-shaped.

Mr. Cunning states that use of the fasteners has saved thousands of feet of belting replacements.

Another interesting practice on this conveyor is the manner in which the belt is lengthened, so the stacker may be advanced. Sections of belting 100 ft. long are laced in advance with No. 75 Alligator steel belt lacing. There are a number of such sections in the belt, and the new section is inserted by pulling the hinge pin out of joint, putting the section in place and inserting the hinge pins. This job is so systematized that it takes only 28 minutes.

The fasteners, plates and lacing were manufactured by the Flexible Steel Lacing Co., Chicago.

Fullers' Earth Gains

Production of fullers' earth in 1935 amounted to 227,745 short tons valued at $2,230,229 compared with 220,264 short tons valued at $2,085,081 in 1934, an increase of 3.4 per cent. in quantity and 7 per cent. in value compared with 1934, thus checking a four-year downward trend in output. The average value per ton also rose to $9.79, an increase of 32 c. over that for 1934.

Nineteen plants in eight states reported production of fullers' earth in 1935. The combined output in 1935 of Florida and Georgia (64 per cent. of the total United States production) was slightly less than in 1934, but the value increased. Production in Texas increased in 1935 to 40,925 tons, valued at $391,641, a gain over 1934 of 25 per cent. in quantity and 20 per cent. in value.

Personal Mention

Roy Averill, who has been director of WPA engineering operations at Kansas City, Mo., for more than a year, has resigned to become a field engineer for the Portland Cement Assn. Mr. Averill will be attached to the association's district offices at Kansas City.

E. T. Paul, sales representative for the National Lime & Stone Co., Findlay, O., is temporarily serving as superintendent of the company's plant at Lewisburg, O., following the recent death of Harry Albert, who had served as superintendent for six years. Mr. Albert met his death in an automobile accident.

Walter A. Parrish has been appointed chief engineer by the Buda Co., Harvey, Ill., to succeed the late Carl C. Hinkley. Mr. Parrish has had wide experience in the design and application of internal-combustion engines. Formerly with the Hudson Motor Car Co., he has been with the Buda Co. since 1928. L. C. Moxie will be assistant chief engineer.

J. E. Borland, after a year spent in activities associated with the electrification of South African gold mines, has returned to the industrial-sales department of Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., where his work will be concerned with the application of electrical equipment to power shovels, quarrying and mining operations.

Stanley H. Hunter has been made sales manager of the American Hoist & Derrick Co., St. Paul, Minn. He was formerly with the Novo Engine Co., Lansing, Mich., where R. B. Harvey succeeds him as sales manager.

A. B. Baumgartner, superintendent of the quarry operated by the Chicago & Northwestern Rwy. Co. at Le Grand, Ia., was rendered temporarily homeless a few weeks ago when fire destroyed his residence located near the quarry.

H. H. Steck, formerly of the Norton Co., has been appointed grinding-wheel sales representative for United States Rubber Products, Inc., in the Pittsburgh District.

F. J. Wood has been appointed chief engineer of the industrial manufacturing division of the Goodman Mfg. Co., Chicago.

Irwin F. Bingham, who has been assistant professor of petroleum engineering at the University of Oklahoma, Norman, Okla., has resigned from the faculty to become petroleum engineer for the Universal Atlas Cement Co. Mr. Bingham will work in the Texas and Oklahoma oil fields. Last summer he was temporarily engaged by the Universal Atlas company in research work involving the use of slow-setting cement for oil wells.

Howard V. Clark, formerly sales manager at St. Paul and Minneapolis has been made general manager of the order division in Pittsburgh and Chicago by the Carnegie-Illinois Steel Corp. W. G. Somers succeeds him.

Hollis Peck and R. R. Rittenhouse of Santa Cruz, Cal., are preparing to develop, in Calaveras County, what is said to be the only slate quarry west of the Mississippi River. An expenditure of $50,000 for equipment is anticipated.

Earl D. Stearns has been appointed sales manager of the Barber-Greene Co., Aurora, Ill., manufacturers of loaders, conveyors, pavers, etc. His past experience includes 12 years with the Stephens-Adamson Mfg. Co., including eight years as manager of its Pittsburgh and New York offices. He was later, successively vice-president and sales manager of the H. K. Ferguson Co.; president of Stearns Conveyor Co.; vice-president and sales manager of the Fairfield Engineering Co., and western sales manager of the Robins Conveying Belt Co. In his association with the Barber-Greene Co. since 1933 he has been in charge of engineering sales.

Frederick S. Cook has been appointed Pacific coast manager for the Robert W. Hunt Co., with headquarters at San Francisco.

William P. Yant, well known for his work as chief chemist of the U. S. Bureau of Mines has become director of research of Mine Safety Appliances Co., Pittsburgh, Pa. Mr. Yant has been associated with the Bureau of Mines in various directorial capacities since shortly after his graduation from Wooster College, Wooster, O., in 1918.

J. L. Whalen has been made district representative in charge of the regional sales office recently opened at 549 West Washington St., Chicago, Ill., by the Gates Rubber Co., of Denver.

Ralph S. McCrea has been made assistant to the president, Sand Products Corp., Detroit, Mich. He was formerly vice-president and general manager of the West Michigan Dock & Market Corp., a subsidiary of Sand Products Corp.

C. Gilbert Norton has joined the publicity department of Combustion Engineering Co., Inc., New York. For the past eight years he was director of the service department of Thomsen-Ellis Co., Baltimore. He previously was assistant advertising manager of the Lehigh Portland Cement Co.

Walter E. Hawkinson has been elected treasurer of Allis-Chalmers Mfg. Co., Milwaukee, Wis., succeeding the late Raymond Dill.

J. C. Wise is manager of the new Cleveland district office of the Rockbestos Products Corp., New Haven, Conn.

Philip St. Julien Wilson, 69, chief engineer of the U. S. Bureau of Public Roads died at his home in Washington, D. C., September 17 after a six weeks' illness. Mr. Wilson was formerly state highway engineer of Virginia but had been with the Bureau of Public Roads since 1914.

Ruben G. Miller, 56, an employee of the Ready Mixed Concrete Co., Kansas City, Mo., met his death recently when he fell down a 27-ft. shaft at one of the company's crushed-stone plants near Kansas City.

Lawrence Jones, Jr., 38, president of the Jefferson Island Salt Co., died of pneumonia recently at his home in Louisville, Ky.

Finley B. Campbell, retired manager of the Pacific Coast Borax Co., died Sept. 18 at his home in Chicago, Ill., of pneumonia. He was 68 years old. Mr. Campbell retired from business because of ill health two years ago, after nearly 35 years as manager of the borax concern.

Ralph A. Irving, 43, president of the Irving Bros. Sand & Gravel Co., Fort Wayne, Ind., was fatally injured September 5 when he fell from a portable plant the company was operating near Coldwater, Mich., where it has a contract to supply gravel for a highway project. Death was due to a fractured skull, Mr. Irving having died enroute to a Coldwater hospital after the accident.

ANIMATED MODEL CEMENT PLANT AT TEXAS CENTENNIAL

FROM a small local mill in Dallas, Tex., the International Cement Corp. has grown to its present position as one of the world's largest cement producers, operating 14 plants with a total annual capacity of 24,000,000 bbl. All domestic mills of the International system now market their product under the fine old Texas name of "Lone Star." With the Texas Centennial exposition being held at the birthplace of the corporation, it was deemed fitting that the concern coöperate with an exhibit of which the above is a photograph. This animated model of a Portland-cement plant is located in the Natural Resource and Petroleum Bldg. and has attracted large crowds of visitors. A 16-page booklet describing the manufacture of cement is given away as a souvenir.

☆ ☆ ☆ ☆ ☆ ☆ ☆

Erects Thoroughly Modern Office-Display Building

Completely insulated construction, year around air conditioning, sound proofing and the use of glass-block windows, diffusing skylights and Venetian blinds for the scientific control of lighting are some of the features of

Glass-block walls provide ideal north light in the drafting room.

the new general office building of The Jaeger Machine Co., at Columbus, O. According to O. G. Mandt, vice-president and general manager, expansion of the company's business, which in the first eight months of 1936 has more than doubled the entire volume for 1935, made necessary this move to larger and more efficiently arranged quarters. All offices have been located on one main floor, each department grouped in relation to its work with other departments. On the floor below is a 10,000 sq. ft. show room for displaying and demonstrating the company's products—pumps, mixers, hoists, truck mixers and road machinery.

General office completely inclosed, under diffusing skylights.

The building, of block and stucco, with floors of reinforced concrete, occupies a landscaped site with wide approaches leading to the private entrance drive. The company's former office building has been converted into shops and experimental plant.

BACON FARREL CRUSHERS

Complete Plants Designed and Equipped. Screens, Elevators, Conveyors, Quarry, Sand and Gravel Plant Equipment. Engineering Service.

EARLE C. BACON, Inc.
71 John Street New York, N. Y.

Kiln-End Nose Rings Are Made of Special Alloy

The Amsco kiln-end nose rings for rotary kilns, described and illustrated in the September issue of PIT AND QUARRY indicated that they were made of Amsco alloy but the head was misleading, since it referred to them as being made of "manganese steel."

Amsco alloy, the American Manganese Steel Co. advises, is a chromium-nickel metal and is completely resistant to heat and the corrosive action of sulphur gases developed in the burning process.

Develops New Type of Gas for Cutting by Flame

A gas marketed under the trade-name "Thermoline" which replaces acetylene for steel-cutting processes is being marketed by the Pittsburgh Thermoline Co., Pittsburgh, Pa.

According to the manufacturer, Thermoline will outlast two to three tanks of acetylene although it is sold at the same price.

Other advantages claimed are that the gas will make a cleaner cut, that the cylinders are lighter and easier to handle, practically no back-firing is experienced, and that the gas has an explosive range of but 4 per cent.

Government Ownership of Railroads Not Favored

Despite the fact that there is at this time no definite proposal for government ownership of railroads there is a very definite wave of objection to government ownership sweeping the country. In an address before the Great Lakes Regional Advisory Board at Cleveland, O., on September 16, R. F. Bohman, general traffic manager of the Heywood Wakefield Co. of Gardner, Mass., made a stirring appeal for the continuation of a privately-owned transportation system. This is only one of many examples of the public interest in this subject and a great deal is being said about government ownership outside of traffic circles. In fact, as Sen. Wheeler says in a recent magazine article, there appears in the press and trade papers a constant and steady stream of articles, news items and accounts of objections criticising government ownership of railroads. The Senator, in his articles, points out that at the present time there is a complete lack of any formidable agitation for government ownership. However, it is remembered that Sen. Wheeler introduced in the last Congress a bill to provide for government ownership of railroads and since the former coördinator of transportation, the railway unions and some shippers favor government ownership this question will continue to be one of primary interest to traffic men at least until the new Congress, which convenes in January, will have adopted or rejected a bill providing for government ownership.

Incorporations

THE ANCHORAGE QUARRY CO. Louisville, Ky., Capital $5,000. Incorporators are Dr. Chas. Reiss, Fred Reiss and J. P. Castleman.

THE STANDARD MICA CO. Asheville, N. C. Capital $100,000. Incorporated by T. B. Summers, Eugene Ward and others.

THE FULLER'S EARTH MINING CO. Mayfield, Ky., Capital $15,000. Incorporated by C. D. Cosby and W. J. Watkins.

THE DOBLASUE LIME & MINING CORP. Republic, Wash., Capital $5,000. Incorporated by J. N. Fry and Ethel B. Foley.

NANTAHALA TALC & LIMESTONE CO. Andrews, N. C., Capital $100,000. Incorporated by Percy B. Ferebee and W. T. Forsythe.

Opens New England District Office at Boston, Mass.

A New England office, staffed for consulting and sales-engineering service to those having problems of instrumentation in manufacturing processes has been opened recently in Boston by Leeds & Northrup Co. Their complete line of measuring, recording and controlling instruments, as well as their electric heat-treating furnaces, will be handled through this office. The address is 422 Chamber of Commerce Bldg., 80 Federal St., Boston, Mass.

Issues Handbook to Guide Users of Commercial Tires

Containing even more statistical information than previous annual volumes, the 1936 edition of the *Operators' Handbook* has just been published by the B. F. Goodrich Co., Akron, O. Into the 66 pages of the handbook has been packed detailed data on tires and tire performances of interest to owners and operators of trucks and tractors.

Milwaukee Firm Appoints New Chicago Distributor

Announcement is made by the Harnischfeger Corp. of Milwaukee, Wis., of the appointment of the Arthur Wagner Co., 701 W. Washington St., Chicago, Ill., as a distributor of Harnischfeger electric motors, generators, engine driven generator sets, portable lighting plants, etc., in the northern Illinois territory.

Foreign Developments

Behavior of Sulphide in Blast-Furnace Cements

A number of investigators have shown that the calcium sulphide contained in basic blast-furnace slag can not be oxidized to sulphate in the presence of air or soft or sea water. Even if these sulphide contents of blast-furnace cement could be oxidized, they would form calcium sulphate directly and not free sulphuric acid, and this calcium sulphate, surrounded by a basic medium, would not be in position to attack reinforcing iron. On the contrary, it forms in the presence of basic slags compounds which are only inclined to improve the hydraulic properties. The presence of sulphide sulphur in slags and in blast-furnace cements made therefrom can not bring about an injurious action on the reinforcing iron. On the contrary, the sulphide content has an advantageous effect on the development of the hydraulic properties of blast-furnace cements.

Sulphide sulphur from blast-furnace slag present in blast-furnace cement concrete is not oxidized to sulphate on long periods of storage in sea water. On the contrary, it gradually works out and is for the greater part dissolved in the sea water, as has been observed in the case of hydrate of lime. The remaining small part of the calcium sulphide either does not change or converts into $Ca(SH)_2$. In any case, it does not lead to the formation of sulphuric acid.—Dr.-Ing. Vieri Sevieri in *Tonindustrie-Zeitung* 60:691-693, 703-704, July 13 and 16, 1936.

Brinell Hardness Test Not Accurate on Cement

Studies on the application of the Brinell method for the determination of the hardness of cement test specimens previously made by Bied, Giusti and Vandone did not yield definitive results; since in those tests cements of the same sort were almost always used, the tests reported on here were conducted with 22 cements of varying composition, and the specimens were prepared both according to the standard testing method and in normal consistency. Parallel observations were made of the impression made by the ball at 500 kg. loading and of the compressive strength, by the standard method, at 7 and 28 days' storage. In order to eliminate the personal factor (which various tests have shown are not inconsiderable), the specimens were prepared and measurements taken in each case by the same person. The results of the measurements of the diameter of the impression and the compressive strengths were plotted as curves, but no similar picture was obtained for all cements, and the impression of the ball was not a constant function of the compressive strength. The diameter of the impression increases at first with increasing compressive strength but beyond a limit which varies with the composition of the cement remains the same even as the strength increases farther. The conclusion is that the Brinell method does not give a perfect indication of the compressive strength of the cement, either in the standard testing specimens or at normal consistency.—A. Sestini in *Cemento,* VII, 78, 372, November, 1935; *Zement* 25:410, June 11, 1936.

Thermal Requirement of Cement-Burning Computed

On the basis of investigations conducted and variously reported since 1932 by the author, for the most part in conjunction with Dr. E. Schwiete, and additional data not previously published, the author sets out the thermochemical bases for the production of cement, the summary equation being $1{,}030 - 640 = 390 \pm 12$ Cal. for 1 kg. of clinker, 1,030 Cal. being the total of endothermic effects and heating and 640 the total of exothermic effects and cooling, that is, heat recovery. The material on which these figures are based is a raw meal of 75.8 per cent. of calcium carbonate and 16.3 per cent. of clay substance, calculated as theoretical kaolinite substance $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$, and 7.9 per cent. of SiO_2 (quartz); the magnesium oxide content of the clinker and the ferrous minerals are not included, although they are separately tabulated. The product is a standard Portland-cement clinker with 66 per cent. CaO, 24 per cent. SiO_2, 10 per cent. Al_2O_3. The 1 kg. of clinker corresponds to 1,553 g. of raw material. —H. Elsner von Gronow in *Zement* 25:437-442, 453-458, June 25 and July 2, 1936.

Pumice Aggregates Yield Lighter Weight Mortars

Experiments conducted and described by the authors show that with pumice aggregates suitably selected with respect to the granulometric composition and with cement contents varying from 100 to 250 kg. per cu. m. it is possible to obtain quite light mortars the weight of which per cubic meter varies from 1,050 to 1,220 kg. These mortars have good insulating properties with respect both to heat and to the transmission of sound, can be used in the construction of remarkably strong walls, and are perfectly nailable. The pumice employed in these mortars showed remarkable puzzuolanic properties in the hot-water tests, but very little in the cold tests; the cold tests thus far reported, however, lasted only 28 days.—Quirino Sestini and Luigi Santarelli in *L'Industria Italiana del Cemento,* April, 1936, Vol. 8, No. 4.

Systematic Classing of Cements Is Proposed

A systematic classification of cements is proposed by the author on the basis of a diagram of the silica modulus-alumina modulus system, and diagrams of the curves of equal sintering temperatures, early high strength, heat of hydration and the fields of stability against the action of sea water. The groupings and terminology suggested from these studies are:

(a) Portland cement—Silica modulus 1.8 to 2.3; alumina modulus 1.5 to

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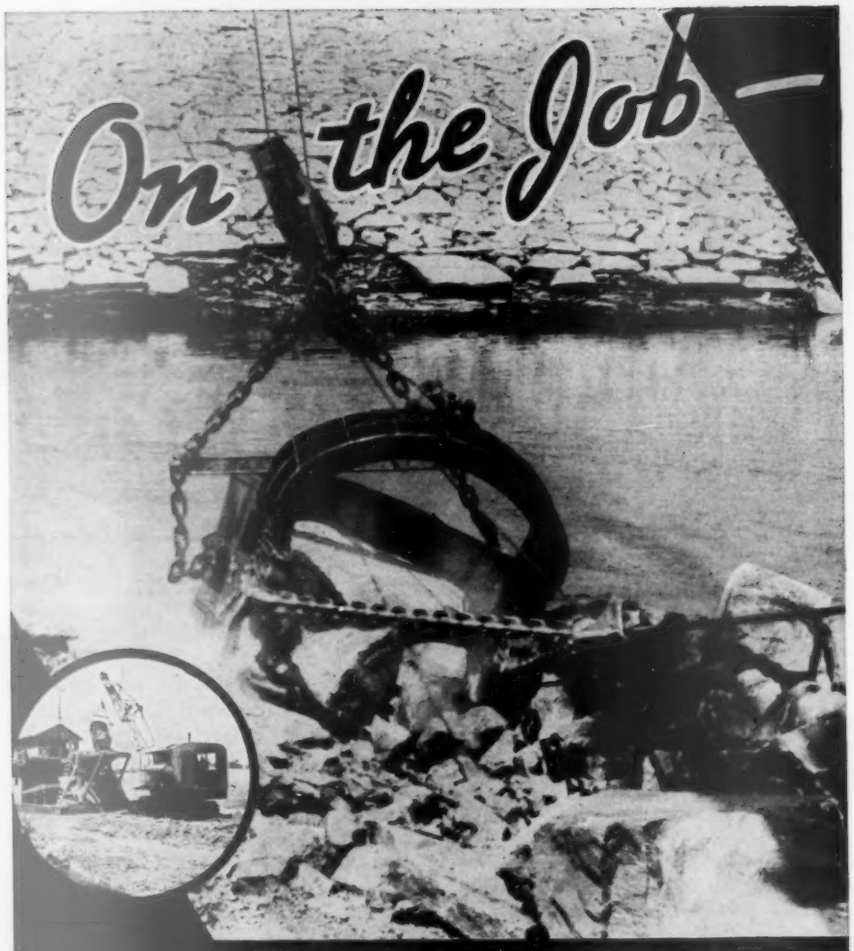

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2.4. An ordinary Portland cement of characteristic properties.

(b) High-silica Portland cement—Silica modulus > 2.5; alumina modulus 1.5 to 2.4. Has the following properties in contrast to Portland cement: Smaller heat of hydration, smaller with increasing silica modulus, higher sintering temperature, good strength properties when it is adequately burned. It is of importance for "massive construction."

(c) Ferro-Portland cement—Alumina modulus < 1.5; Kühl cement, alumina modulus ≈ 1.3; Brownmillerite cement, alumina modulus ≈ 0.6; Michaelis cement, alumina modulus ≈ 0.2. Has the following properties in contrast to Portland cement: Great high early strength, slight heat of hydration and shrinkage, stability to sea water, low sintering temperature. All these properties are better with decreasing alumina modulus. It is of importance as a "reinforced-concrete cement," "road-building cement," "massive-construction cement" and "sea cement."

(d) Alumino-Portland cement—Alumina modulus > 2.4. Has the following properties in contrast to Portland cement: It is insensitive to excess of water, and is consequently of importance as a "spray cement" (in oil drilling) and as a cement for "casting concrete."—Dr.-Ing. Serban Solacolu in *Zement* 25:403-407, 419-422, June 11 and 18, 1936.

Japanese Continue Study of Saline Solutions

Continuing previous investigations on the same subject, the authors report the results of further studies on the effects of aggressive salt solutions on the hardened cement-sand mortars by comparing their expanding and corroding actions. It was found from the test results that (1) alumina cement decreased considerably in longer water curing and also in 10 per cent. sulphate solution, (2) especially, the cements of Portland cement type disintegrated completely in 10 per cent. Na_2SO_4 solution in eight weeks immersion, (3) high silica mixed Portland cements are resistant to aggressive salt solutions and increase their strengths in long curing, (4) blast-furnace slag cement is also of good quality, (5) so that resistant mortar or concrete for aggressive sulphate water can only be successfully obtained by using mixed Portland cement, etc.—Shoichiro Nagai and Kenji Nomi in *Journal of the Society of Chemical Industry, Japan* (Supplemental Binding) 39:159B-161B, May, 1936.

Traffic News Digest

Recent I. C. C. Decisions

Crushed Stone—On finding the charges on crushed stone from Phillipsburg, N. J. to Miami, Fla., unreasonable to the extent they exceeded the charges which would have accrued on a rate of 36c. plus 1c. emergency charge on a c.l. minimum weight of 54 lb., the Commission has awarded reparation amounting to $133.20 with interest on a shipment made in August 1935. I. C. C. Docket No. 27,312, Colonna & Co., Inc. *v.* Pennsylvania *et al.*

Lime—Finding the rates on lime (common, hydrated, quick or slaked), from points in Virginia to destinations in North and South Carolina not unreasonable or unduly prejudicial, the Commission has dismissed the complaint in I. C. C. Docket No. 26,644, West Virginia Lime Products Assn. *v.* A. & R. *et al.*

Sand—In order to enable the Atlantic Coast Line to meet barge competition, the Commission in a 7th Supplemental Report has modified the findings and orders in prior reports in 177 I. C. C. 123 and 197 I. C. C. 215 to exempt from the provisions of these reports, the intra-state movement of sand from Pon Pon, S. C. to Charleston, S. C. This will permit the A. C. L. to establish a rate of 50c. a net ton from Pon Pon to Charleston which is to expire December 31, 1936 in lieu of the present rate of 70c. I. C. C. Docket No. 22,-109, sand, gravel, crushed stone, etc. within the state of South Carolina.

Examiner's Report

Limestone to New England Territory—In reopening the case involving ground or pulverized limestone from Lime Crest, N. J., to destinations in New England originally reported in 201 I. C. C. 467 the following three questions were involved: (1) Whether the New Haven and the Pennsylvania-Reading-Seashore Lines should be added as parties defendant; (2) to define New England territory for the purpose of computing the prescribed rates and (3) to determine the reasonableness for the future only of rates on ground or pulverized limestone from Lime Crest, N. J., to destinations in trunk line and New England territories to which the rate making distances exceeded 500 mi.

The evidence at the hearing was directed at the second question, that is, the definition of New England territory, as questions 1 and 3 were settled to the agreement of all parties at the beginning of the hearing.

Lime Crest is located in the extreme northwestern part of New Jersey and is served by the Lehigh & Hudson River Ry. The northern terminus of the L. & H. R. is Maybrook, N. Y., 44 mi. north of Lime Crest where traffic is interchanged with a line of the former Central New England Ry. Co., now a part of the lines operated by the New York, New Haven & Hartford RR Co., (hereinafter called the New Haven.) From Maybrook this line of the New Haven runs northeastward and crosses the Hudson River at Poughkeepsie, N. Y., 27 mi. from Maybrook. Defendants consider this line, as well as lines east of Poughkeepsie, as being within New England rate territory.

Owing to the imposition of the arbitraries for the hauls within New England complainant is, of course, desirous that the trunk-line rates apply to practically all points in the extreme eastern port of the state of New York and it contends that the New England rates should be confined only to those states which lie east of the eastern boundary of the state of New York.

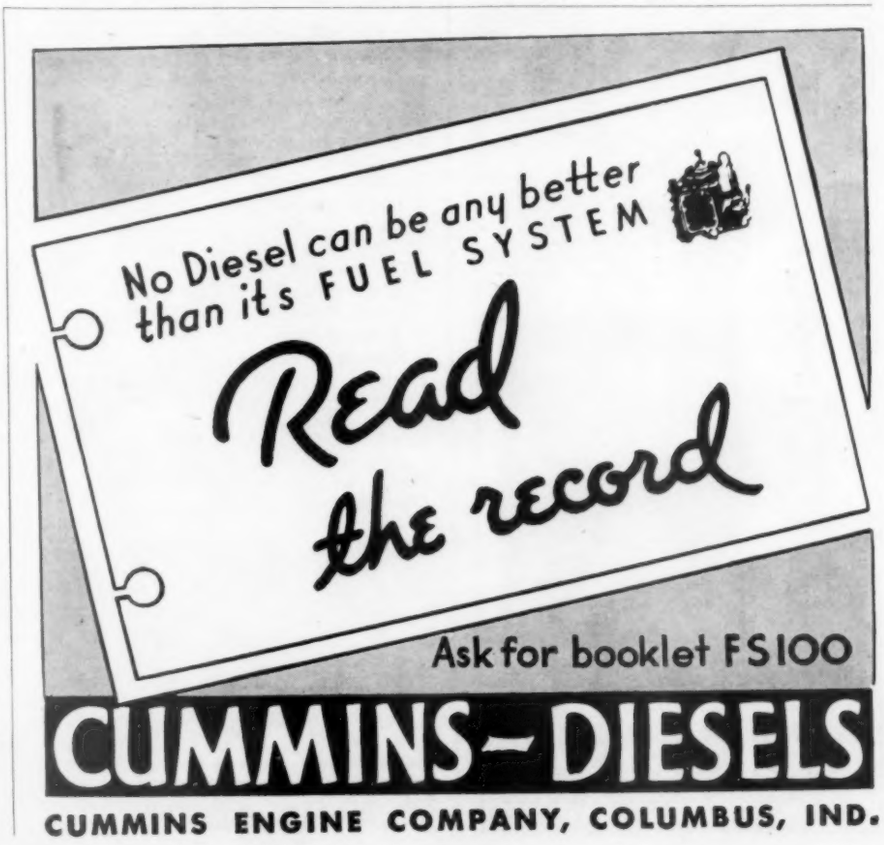
Examiner George Esch, in his proposed report says "as far as this case is concerned, the important New England carrier west of the Hudson River is the New Haven which operates a line running southwest from Poughkeepsie to Maybrook, a distance of 27 mi. and thence a short distance beyond to Campbell Hall, N. Y. Three or four miles to the west this line is parallelled by a branch of the New York Central running from Montgomery north to Kingston, N. Y., and on the east at a distance of seven or eight miles by the line of the New York Central which runs along the west shore of the Hudson River. Running east from Campbell Hall, the southern terminus of the New Haven, are lines of the Erie Railroad Company and the New York, Ontario and Western Railway Company, and running south from Maybrook on the New Haven is the line of the L. & H. R. It will thus be seen that the line of the New Haven here under consideration is surrounded by trunk-line territory lines which are accorded the trunk-line territory rates, while the line in question, because it is a part of a New England system, is permitted to assess the New England territory arbitraries. This presents a situation which should be corrected. Moreover, this line of the New Haven is thrust down into trunk-line territory for a distance which brings the New England territory rates within 50 mi. of complainant's plant at Lime Crest, N. J. The short-line distance to Port Morris, New York City, from Lime Crest via Sparta Junction, N. J., is about 70 mi. and the distance from Lime Crest to Poughkeepsie is 71 mi. If, therefore, the New England differentials were eliminated from that line of the New Haven which extends west of the Hudson River, the trunk-line rate territory hauls from Lime Crest to Port Morris and Poughkeepsie would be approximately the same.

From a rate standpoint as well as a geographical standpoint it would appear that the logical line of demarcation between New England and trunk-line territories is the Hudson River and Lake Champlain. Therefore, so far as the rates involved in this proceeding are concerned and so far as the New England carriers and the Delaware & Hudson are concerned, New England rate territory should be described as that part of the United States lying east of the line of the New York Central which extends northward from New York City along the east bank of the Hudson River through Peekskill, Poughkeepsie, Hudson, and Rensselaer, N. Y., to Troy, N. Y.; east of the Delaware & Hudson running north from Troy to Mechanicsville, N. Y.; east of the east bank of the Hudson River from a point opposite Mechanicsville to Fort Edward, N. Y.; and east of the Delaware & Hudson running north from Fort Edward through Whitehall, Fort Ticonderoga, Plattsburg, and Canada Junction, N. Y., to Rouses Point, N. Y.

The Commission should find that for the purposes of this proceeding New England rate territory is as defined in this report." I. C. C. Docket No. 24,757, Limestone Products Corp. of America *v.* Lehigh & Hudson River *et al.*

New Complaints Filed

Agricultural Limestone—Alleging unreasonable rates on agricultural limestone prior to July 1, 1936, and on ground limestone since July 1, 1936, from Woodville, O., to destinations in Central Freight Assn. and trunk-line arbitrary territories in New York, Pennsylvania and West Virginia, new rates and reparation are prayed for in a complaint filed by E. H. Mauntler, Secretary, Woodville, O., in I. C. C. Docket No. 27,472, Sub. No. 2, Ohio Hydrate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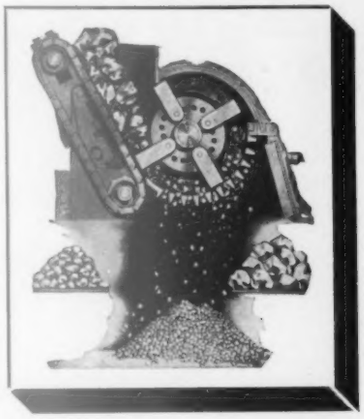

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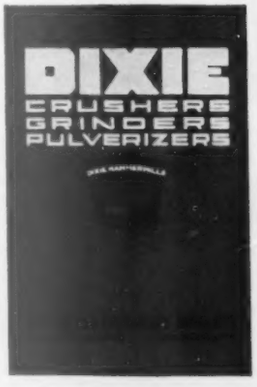

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& Supply Co., Woodville, O. *v.* Pennsylvania *et al.*

New rates and reparation are sought on agricultural or ground limestone from Woodville, O., to destinations in Indiana under Section 1 in a complaint filed by Frank E. Coombs, Traffic Manager, Woodville, O., in I. C. C. Docket No. 27,472, Ohio Hydrate & Supply Co., Woodville, O. *v.* Pennsylvania *et al.*

Cement—A complaint alleging violation of Sections 1, 2 & 3 on cement from Laramie, Wyo., to destinations in New Mexico with competitors in Colorado, Texas, Oklahoma, Missouri, Kansas and Nebraska, has been filed by Wm. D. Burnett, Attorney, 215 West 7th St., Los Angeles, Calif. New rates for the future are requested. I. C. C. Docket No. 27,523, Monolith Portland Midwest Co., Los Angeles, Cal. *v.* Santa Fe Northwestern *et al.*

The rates on cement from Boettcher, Colo., to destinations in New Mexico have been attacked under Sections 1 & 3 with competitors in Missouri, Kansas, Oklahoma and Texas, allegedly preferred. New rates for the future are sought in the complaint filed by E. W. Martindell, Traffic Manager, 821-17th St., Denver, Colo., in I. C. C. Docket No. 27,529, Ideal Cement Co., Denver, Colo. *v.* A. T. & S. F. *et al.*

Crushed Stone—A Section 1 complaint seeking new rates and reparation on crushed stone from Sloan, Nev., to Dyer, Cal., has been filed by Lowe P. Sidons, Attorney, P. O. Box No. 1052, Colorado Springs, Colo., in I. C. C. Docket No. 27,519 Holly Sugar Corp., Colorado Springs, Colo. *v.* A. T. & S. F. *et al.*

Crushed Stone, Sand and Gravel—The Commission has suspended from September 15 until April 15 schedules in Agent Roy Pope's I. C. C. No. 34 proposing to revise rates on crushed stone, sand, gravel and related articles from points in Alabama, to destinations in Florida, south of the line of the Seaboard Air Line from Jacksonville to River Junction, Fla. The proposed schedules contain both increases and reductions. I. & S. Docket No. 4,245.

Sand—Rates filed by the Nickel Plate in Supplement No. 22 to I. C. C. No. 5,659 proposing to reduce the rates on sand and gravel from Cayuga, Ind., to destinations in eastern Illinois on the Nickel Plate, to meet motor truck competition have been suspended by the Commission from August 23 until March 23 in I. & S. Docket No. 4,233.

A Section 1 complaint seeking reparation on industrial sand moving from Ottawa, Ill., to Middletown, Pa., has been filed by Wm. H. Neely, Attorney, 902 Mechanics Trust Bldg., Harrisburg, Pa., in I. C. C. Docket No. 27,503, Wincroft Stove Works, Middletown, Pa. *v.* C. R. I. & P. *et al.*

New rates and reparation are sought on an allegation of unreasonable rates and charges on sand from Elnora and Ushers, N. Y., to Philadelphia, Pa., in a complaint filed by L. V. Brandt and Edgar O. Anderson, Practitioners, Stationery Mart Bldg., Chicago, Ill., in I. C. C. Docket No. 27,505, Enterprise Mfg. Co. of Pennsylvania, Philadelphia, Pa. *v.* C. of N. J. *et al.*

The charges on industrial sand from Menantico, N. J., to Waynesboro, Pa., have been attacked and reparation is being sought in a Section 1 complaint filed by Wm. H. Neely, 902 Mechanics Trust Bldg., Harrisburg, Pa., in I. C. C. Docket No. 27,509, Frick Co., Inc., Waynesboro, Pa. *v.* Pennsylvania Reading Seashore Lines *et al.*

Schedules published in Supplement 35 to V. T. Jones' I. C. C. No. 2,763 proposing to restrict the application of the present proportional rate on molding sand from Evansville, Ind., group to East St. Louis, Ill., so as not to apply to upper Mississippi River crossings have been suspended by the Commission from September 1 until April 1. The suspended schedules would result in increased rates on shipments from the south to destinations beyond East St. Louis in eastern trunk-line territory. I. & S. Docket No. 4,240.

A Section 1 complaint seeking new rates and reparation on sand from Ottawa, Ill., to Hatboro, Pa., has been filed by L. V. Brandt and Edgar O. Anderson, Practitioners, Stationery Mart Bldg., Chicago, Ill., in I. C. C. Docket No. 27,513, Roberts & Mander Stove Co., Philadelphia, Pa. *v.* C. B. & Q. *et al.*

The above practitioners have filed another complaint under Section 1 seeking reparation on sand from Cedar Lake and Millville, N. J., to Elmira, N. Y., in I. C. C. Docket No. 27,516, Kennedy Valve Mfg. Co., Elmira, N. Y. *v.* C. of N. J. *et al.*

In another complaint filed by Brandt and Anderson under Section 1 reparation is sought on a movement of sand from Ottawa, Ill., to Warren (Struthers), Pa. in I. C. C. Docket No. 27,513, Sub. No. 1 Warren Gear Mfg. Co., Warren, Pa. *v.* Belt Railway of Chicago *et al.*

In another complaint filed by the same practitioners under Section 1 reparation is sought on sand moving from Ottawa, Ill., to Syracuse, N. Y., in I. C. C. Docket No. 27,531, Easy Washing Machine Corp., Syracuse, N. Y. *v.* C. B. & Q. *et al.*

Traffic News

Emergency Charges—Traffic executives of American Railroads have submitted to the Board of Directors of the Association of American Railroads proposed plans for making permanent most of the present emergency rates which will expire on December 31 this year unless a further extension is granted.

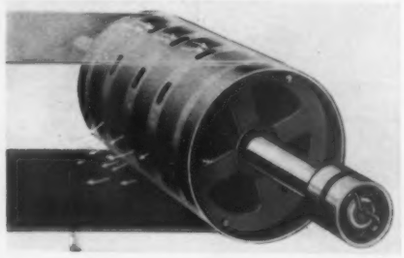
Since the Commission declined the request of the carriers for an extension of the emergency rates as published or to hold a further hearing on the subject of extension of emergency charges it will be necessary for the carriers to publish these charges in supplements to the various tariffs naming the rates to which the emergency charges are to be added.

The law requires that new tariffs be filed with the Commission and posted at railroad stations 30 days before the date on which they are to become effective unless the Commission grants authority to issue the tariffs on less than the 30-day notice. Under the circumstances and in view of the objection of shippers generally to an extension of the emergency charges beyond 1936, it is not likely that the Commission would grant permission to establish the rates on less than the 30-day period required. This means that the new tariffs or supplements making the emergency charges effective beyond January 1, 1937, must be filed with the Commission not later than Dec. 2, 1936, which is rather a short time considering the enormous amount of work necessary to the publication of the required supplements. As soon as the tariffs have been filed they will be subject to suspension and investigation by the Commission and it is altogether likely that a suspension may result as so many shippers are objecting to an extension of the emergency charges and since the Commission refused to hold another hearing to determine the lawfulness of extending these charges beyond the end of this year. Another thing that makes it seem probable that requests for suspension would be granted is the fact that the Commission in rendering its decision extending the emergency charges until the end of 1936 was divided in its opinion with a bare majority of the Commissioners who took part in the proceeding favoring the extension until that date. During the next 60 days this subject of emergency charges will probably be the headliner in traffic circles.

New Machinery and Supplies

Slots in Magnetic Pulley Cool Coils Efficiently

The operating action of the conveyor belt is used by the Stearns magnetic-separator pulley for an unusual type of radiating ventilation which serves to lower the heat around the coils, thereby producing a much more powerful pull and sustained efficiency in prolonged action, according to R. H. "Ross" Stearns, president of the Stearns Magnetic Mfg. Co., Milwaukee, Wis. Through a system of specially-designed air ducts, the air is forced into the radiating



Magnetic conveyor pulley showing improved air-circulation system.

areas of the pulley by the upper belt and in turn is sucked out by the action of the return belt. This provides a continuous circulation of cooling air through the pulley.

By this design the pulley exerts from 25 to 50 per cent. more magnetic pull in pounds per square inch, an increase in power which is appreciated particularly during rush and overload periods. Stearns pulley castings are one piece and are annealed to insure maximum permeability. The pole or flanges of the coil sections are sloped toward the core, giving increased area and consequent greater flux density or magnetic strength at the face of the pulley.

After machining, the casting is heated slowly to a temperature of 300 deg. F. after which three coats of special enamel are each baked on. After the casting has cooled, several layers of mica provide further insulation before the magnet wire is laid. After connections are applied the coil windings are covered with mica plate and all voids filled with impregnating compound, including the space between the coil windings and the steel covering bands. It has been found that this moisture-proof precaution allows rapid dissipation of the heat produced by the windings through the forced ventilating system.

Steel coil covers are used. The manufacturer claims that tests show steel covers increase magnetic pull from 10 to 25 per cent. Another reason given by the maker for the use of steel as against brass is that the steel plates are attracted to the pulley magnetically, thus preventing the possibility of their becoming loose and causing trouble.

Rolled-Steel Plate Lining for Ball and Tube Mills

In the present types of ball and tube mills for cement and other grinding the life of the cast liner is measured in terms of wear on the lifting bar. Once the risers are worn down enough to impair grinding, the whole plate must be discarded.

Now the Carnegie-Illinois Steel Corp., capitalizing on the adaptability and lighter weight of rolled steel, has announced the Lorain Rolled-Steel Plate Lining with self-wedged lifting bars which are renewable and reversible. Lifts or risers can be renewed without scrapping the body section, cutting costs considerably and at the same time maintaining 100 per cent. grinding efficiency.

Because the high-carbon rolled plate has much greater strength than cast materials, its thickness and weight is considerably reduced. This lowers power costs. The renewable lifter bars are adaptable to the bolt centers of existing mills, wedging themselves between the chamfered edges of the rolled-steel lining plates and acting as a complete hold-down over the entire length of the lining.

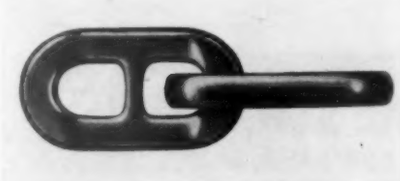
The initial cost and renewal cost of Lorain rolled steel plate lining are said to be much lower than present types of construction.

Rolled-steel plate mill lining showing the removable riser bars.

Further information and complete technical data may be obtained by writing the Carnegie-Illinois Steel Corp., Lorain Division, Johnstown, Pa. The type of mill and its dimensions should be given.

Improves Manganese-Steel Drag-Line Bucket Chain

Cast manganese steel drag-line bucket pulling and hoisting chains were first introduced by the American Manganese Steel Co. in 1928. They promptly proved their economy by giving several times the wearing life of ordinary chains with a resistance to breakage fully equal to chain usually employed. Since then, a large number of drag-line operators throughout the country, and several drag-line bucket manufacturers have proved to their own satisfaction that cast heat-treated manganese steel chain is definitely economical in the severest service.



New link design of manganese-steel chain for drag-line service.

The American Manganese Steel Co. now announces a new design of drag-line bucket chain as illustrated, on which patent has been applied for.

The manufacturer claims ten distinctive design features:

1. Increased strength over previous Amsco chain.
2. Full line instead of point bearing between links.
3. Additional metal on sides of links where abrasive wear comes.
4. Lighter weight than comparable cast chains.
5. Considerably lighter weight than previous Amsco chain.
6. Tie bar across link to prevent snarling and kinking.
7. Equalized metal sections insuring perfect heat-treatment in manufacture and consequent better physical properties.
8. Clean lines making for clean castings.
9. Distinctive design.
10. Made of heat-treated austenitic manganese steel which combines strength, toughness, and wear resistance.

Acquires U. S. Rights to Rotary Louvre Drier

Announcement is made by Link-Belt Co., Chicago, Ill., that it has acquired the manufacturing and sales rights for North America, for the Dunford & Elliott rotary louvre drier, of which many installations have been made in Europe, Canada and Japan.

It is being offered for the drying of all types of granular materials, coarse or fine, or

BAY CITY *for stamina!*

MODEL 20
FULL ⅜ YD. CAPACITY
4 TON CRANE LOAD
WEIGHS ONLY 10 TONS

Just a few of the 25 Points of Superiority

Helical cut gears—noiseless, long wearing.
Unit car body and machinery table, totally heat treated.
Frictionless bearings thruout.
6 cylinder power.
Drop forged crawler shoes.
Chain crowd with automatic adjustment.
Fast operating speeds.
Safety worm boom hoist.
Separate hoist drums.
Full cab enclosing ALL machinery.

TYPES AND SIZES

Capacity	*Model*
⅜ yd.	20
⅝ yd. (Truck Shovel)	10
⅝ yd. (Tractor Shovel)	¾ Circle
½ yd.	30
⅝ yd.	38
¾ yd.	45
⅞ yd.	52
1 yd.	62
1¼ yd.	65

The best buy is Bay City

BAY CITY SHOVELS Inc.
BAY CITY, MICH.

of irregular shape, size and consistency. Among the materials handled are cement clinker, kaolin, limestone, marl, mica, sand and talc.

The drier is described briefly as a mechanically-rotated horizontal drum with a series of internal channels near the circumference, into which hot air is admitted from a fan. These channels are covered by tangential plates which overlap in such a way as to leave a gap for hot air to pass from the channels into the inside of the drum and into the material contained therein, and at the same time to prevent any material from falling backwards. The channels are tapered so as to give the inner lining of the drum a gentle slope from the feed end to the discharge end. As the drum revolves, fresh channels come underneath the charge, but, as the hot air can only enter the channels when they are actually underneath the charge, all the gases must pass upwards through the bed of material.

It is said that the design of the rotary louvre drier, combined with the gentle mixing action to which the bed is constantly submitted by the slow rotation of the drum, causes the hot air to come into intimate contact with every part of the bed, resulting in efficient heat transfer and uniform drying.

This 35-ton Diesel-electric locomotive is in service at the sandstone workings of the Cleveland Quarries Co., near Amherst, O. It replaced a 70-ton steam unit in April of this year and is said to be effecting a material saving in operating cost over the equipment formerly employed. The Euclid Road Machinery Co., Cleveland, O., which built the locomotive is also manufacturing a 55-ton Diesel-electric model.

Announces Wagon Scraper of 10-Cu. Yd. Capacity

The tractor-equipment division of the Continental Roll & Steel Foundry Co., East Chicago, Ind., announces the addition of a new 10-cu.yd. wagon scraper to its line of tractor and road building equipment.

This wagon-scraper, known as Model CS10A, is the full carrying type tractor scraper, identical in design and appearanrce to the Continental 5- and 7-cu.yd. wagon-scrapers, and embodying the same general operating features.

It is ruggedly constructed throughout of dynamic heat-treated alloy castings, alloy heat-treated shafts; the digging bucket, the patented front apron and rear dump door being fabricated of special steel plate, arc welded into strong one piece units. Overall length is 16 ft. 9 in., width 11 ft. 9½ in., height 6 ft. 9 in.

This new Continental, built for use with 75 hp. and larger tractors, is especially designed for digging, stripping, loading, hauling and dumping the tough clays and gumbo soils, shales, hard pan and rocky soils as well as the loams and sandy clays, etc.

The hydraulic power control unit furnished with this wagon-scraper consists of a new heavy-duty hydraulic pump, embodying all the proved features to give a long lived, trouble free, power unit; a free working-control valve and rear-type control lever allowing fingertip control by the tractor operator.

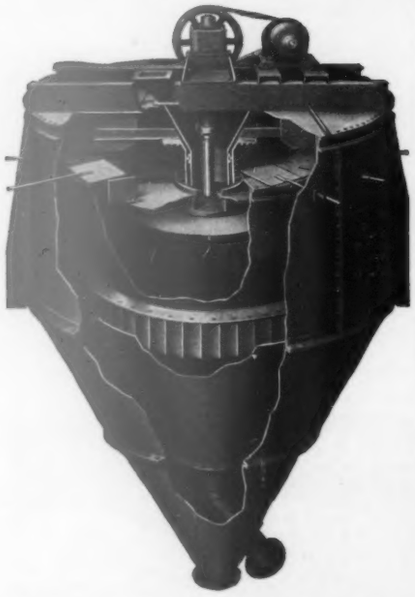
The 10-cu. yd. scraper mounted on massive pneumatic tires.

Heavy-Duty Portable Unit Crusher Is on Market

The accompanying illustration shows a new model Eagle "One Unit" rock crusher recently placed on the market by the Eagle Crusher Co., Galion, O. The crusher, 35-hp. motor and heavy transmission, built into one complete unit, having two speeds forward and one reverse, is now offered as a heavy-duty portable machine. The crusher has a capacity up to 10

The "one-unit" crusher mounted on pneumatic tires.

STURTEVANT



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are the modern means of producing extremely fine products and increasing Mill capacities. Tell us of your problem.

STURTEVANT MILL CO.
Harrison Square, BOSTON, MASS.

PERFORATED METAL SCREENS
FOR SAND, GRAVEL STONE, ETC.

Manufactured exactly to your specifications.

Any size or style screen, in thickness of steel wanted with any size perforation desired.

We can promptly duplicate your present screens at lowest prices.

Prompt Shipment

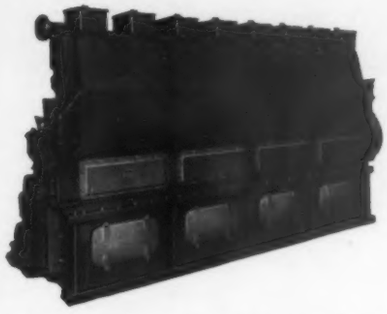
CHICAGO PERFORATING CO.
2435 W. 24TH PLACE CHICAGO, ILL.
Telephone CANAL 1459

cu.yd. per hr., and may be easily adjusted for crushing ¼-in. to 3-in. stone while in operation. The unit may be equipped with steel wheels or pneumatic tires and, if desired, may be obtained with loading elevator. The unit weighs 12,000 lb.

The same crusher was illustrated on p. 64 of the September issue of PIT AND QUARRY but the description which accompanied it was of a different crusher and readers were somewhat confused.

Improved Diesel Engine Is Offered in Several Sizes

The Ingersoll-Rand Co., New York, N. Y., recently announced its Type S Diesel engine. This engine is an improved design which is thoroughly modern in all respects. It is of the vertical, 4-cycle, single-acting, solid-injection



The Type S Diesel engine available in sizes from 150 to 460 hp.

type designed to run at medium speeds and built for heavy-duty, continuous service.

The fundamental design is similar to that of the successful Ingersoll-Rand locomotive engine of which there are more than 140 in operation. Some of these have been in service for over 12 years.

Type S engines are made with 3, 4, 5, 6 and 8 cylinders for ratings from 150 to 460 hp.

A new 24-page bulletin describing these engines has just been issued. It may be obtained from any Ingersoll-Rand branch office.

Big Tractor Scraper Makes Ideal Stripping Machine

The Dig-N-Carry scraper of 12-cu. yd. heaped capacity being produced by the Heil Co., Milwaukee, Wis., is an ideal machine for stripping and other earth-moving operations.

The scraper is controlled by the tractor operator, a hydraulic hoist forcing the cutting edge into the earth to the desired depth. As the scraper moves along, a ribbon of earth rolls up into the scraper bowl and continues until it is filled to capacity. When the control lever is reversed the cutting edge raises and an apron lifts to confine the load. The company claims efficient operation on hauls up to 2,400 ft.

Under average working conditions, the cost of moving material with the big machine varies from 3½ c. per cu. yd. on 100-ft. hauls to 18½ c. on trips of 2,400 ft. in one direction.

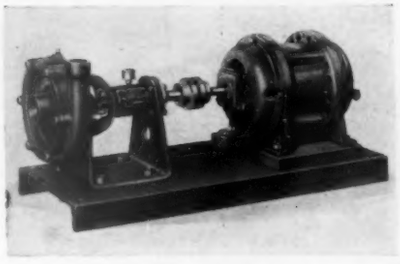
Removable teeth on the cutting edge, high clearance in hauling the load, and a rigid, all-welded frame are some of the features of the machine.

Small Centrifugal Pump Has Pressed-Steel Frame

A small, high-quality, low-cost centrifugal pump is announced by Worthington Pump & Machinery Corp., Harrison, N. J.

The utilization of a pressed-steel frame combined with quantity production make possible a low-cost unit. Simplicity of design results in fewer wearing parts and low maintenance costs. The compactness of the unit makes it easily adaptable to almost any installation within its head capacity range.

The pumps are furnished with direct motor drives or with pulleys for belt drive. The motor sizes range from ⅓ to 3 hp., delivering from 10 to 130 gal. per min. with heads from 10 to 100 ft.



Small centrifugal pump direct-connected to a motor.

The shaft is supported by two ball bearings enclosed in a dirtproof and moisture proof housing. The suction head is easily removable for inspection of the pump's interior. A choice of standard, all-iron, and all-bronze fittings is offered.

Scraper operating behind Diesel-powered tractor.

New Respirator Approved for Use in Type A Dusts

With nonmetallic-minerals producers facing the growing hazard of industrial dusts to their employees health, the increasing need for mechanical devices to aid in the prevention of dust diseases is of paramount concern. One of the newest respirators to be issued with the approval of the U. S. Bureau of Mines for use in Type A, or pneumoconiosis (silicosis) producing dusts is the Dupor Plate Respirator made by H. S. Cover, South Bend, Ind.

Light-weight respirator has large filtering area.

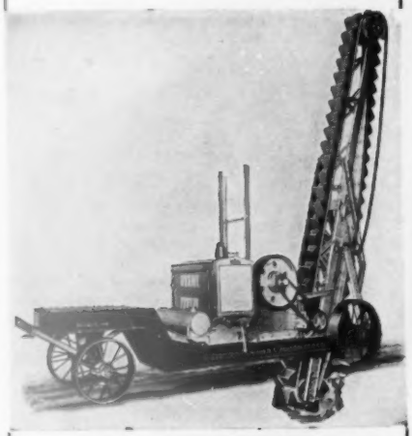
The respirator bears the Bureau of Mines approval number BM 2111. As the illustration indicates, the device is light in weight and has a large filtering area, approximately 24 sq. in., which allows easy breathing yet is highly efficient in removing the harmful dust particles. The respirator is comfortable to the wearer, does not obstruct vision and can be carried in the pocket when not in use. There is no dead air space and cleaning is a matter of a few seconds. Filter pads can be quickly replaced or the old ones may be cleaned and used again.

Further information regarding the respirator may be obtained by writing the maker, H. S. Cover, Station A, South Bend, Ind.

PYRASTEEL
for high temperatures

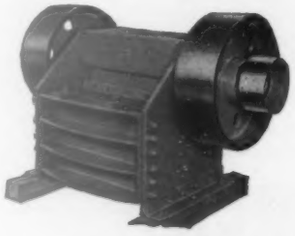
DRAG CHAIN
PYRASTEEL for 2000° F.
EVANSTEEL up to 1200° F.
Will outlast any other materials
Chicago Steel Foundry Co.
Kedzie Ave. at 38th Street
CHICAGO, ILL.
MAKERS OF ALLOY STEEL FOR 25 YEARS

GRUENDLER EQUIPMENT



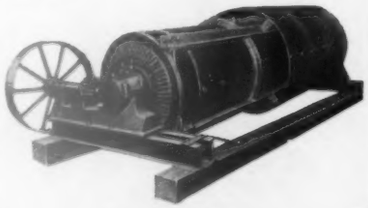
UNIT PLANTS

Built in portable, semi-portable and stationary units in all capacities from 100 to 4,000 tons per day.



CRUSHERS

Roller bearing type with Overhead Eccentric for both primary and fine reduction. Saves 90% in lubricating costs.



SCREENS

Revolving Heavy Duty Screens with dust-tight roller shaft bearings of extra large babbitt. Heavy steel ribs prevent sagging of screen. For maximum continuous capacity.

Write for Bulletins for details of Crushing and Screening Equipment.

GRUENDLER
Crusher & Pulverizer Company
2915 North Market St., Dept. PQ
ST. LOUIS, MO.

The new Autocar Model N dump truck of 10-cu. yd. capacity. Built on a 10⅜-in. frame, this model is dumped by a Garwood hoist. The body is 12 ft. long.

Introduces New Standard Iron-Body Gate Valves

A new line of standard iron-body wedge gate valves, which has been developed by The Kennedy Valve Mfg. Co., has several features of interest.

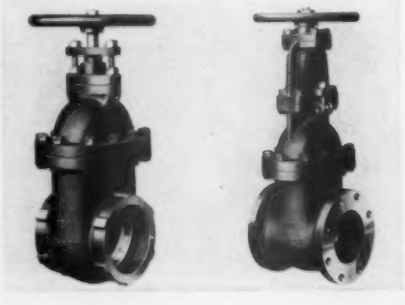
The metal in these valves is of a particularly dense structure and on test by an outside laboratory has proved to be more than 50 per cent. stronger than ordinary cast iron. Bodies are of oval section with well-rounded corners, the flanges and bolts are heavy and ribbing is provided at the flanges on the larger flanged-end valves and at the yokes and caps of outside-screw-and-yoke valves.

There are no studs at any part of the valves, and all bolts have the nuts above the flanges and with ample room for standard open-end wrenches. The stuffing-box bolts and nuts are rust-proofed to prevent corrosion.

An additional feature of special interest is the use of heavy bronze bushings wherever the stem passes through a cast-iron part, as at the yoke cap, packing gland and stuffing box. These bushings prevent corrosion and scoring of the stem which might make operation more difficult and wear out the packing quickly.

The screwed-end valves have round ends for best distribution of metal and lugs for convenient application of pipe or chain wrench. Handwheel rims are of oval section and have only five spokes, permitting ample room for the operator's hands even if gloved. The disks are reinforced with interior posts, are self-draining in any position, and are reversible and interchangeable.

These valves are made in all standard sizes from 1½ in. to 60 in. for steam working pressures of 150 lb. and water working pressures of 200 lb. Complete description, prices and dimensions may be obtained by addressing The Kennedy Valve Manufacturing Co., Elmira, N. Y.



Two of the new wedge gate valves.

Full View with Complete Safety Claimed for Goggle

The American Optical Co. announces another addition to its line of eye-protection equipment—the F-3105 Ful-Vue goggle. This equipment, according to the manufacturer, has all the comfort and safety features of the regular Ful-Vue goggle—high-up endpieces, self-adjusting nose pads, 6-curve super armorplate lenses—*plus* side shields that provide extra protection against particles striking from any direction.

Safety goggle featuring full-view visibility.

The wire-mesh screens are non-corrosive and easily cleaned. The mesh is sufficiently fine to prevent the passage of flying particles but does not hinder air circulation. The metal frame is also non-corrosive and is available in a wide variety of bridge sizes. Descriptive literature is available on request.

Coming Events

November 18-20, 1936. Washington, D. C. Sixteenth annual meeting, Highway Research Board. Roy W. Crum, director, 2101 Constitution Ave., Washington, D. C.

December 7-10, 1936. Memphis, Tenn.—Annual convention and show, National Sand and Gravel Assn. Peabody Hotel.

December 11, 12, 1936. Memphis, Tenn.—Annual convention and show, National Ready Mixed Concrete Assn. Peabody Hotel.

December 14-17, 1936. Chicago, Ill.—Annual meeting, Portland Cement Assn. Blackstone Hotel.

January 11-16, 1937, New Orleans, La.—Annual convention and show, American Road Builders' Assn.

January 18-20, 1937, Cincinnati, O.—Annual convention and show, National Crushed Stone Assn. Netherland-Plaza Hotel.

Trade Literature

Style B Centrifugal Vibrating Screens. 12 p. (Allis-Chalmers Mfg. Co., Milwaukee, Wis.)

P & H Dragline Buckets . . . ⅜ to 4 Cu. Yd. 4 p. (Bulletin D-4. Harnischfeger Corp., Milwaukee, Wis.)

Link-Belt Vibrating Screens. 24 p. (Catalog 1562. Link-belt Co., Chicago, Ill.)

Reconditioned Machinery. 12 p. (Bulletin No. 20. The Morse Bros. Machinery & Supply Co., Denver, Colo.)

The Link-Belt Rotary Louvre Dryer. 4 p. (Bulletin 1511. Link-Belt Co., Chicago, Ill.)

Here Haste Makes . . . Profits! Folder on portable crushing and screening plants. (The Austin-Western Road Machinery Co., Aurora, Ill.)

Superior Diesel Electric Power Units. 8 p. (Bulletin No. 535. Otto Engine Works, Holmesburg, Philadelphia, Pa.)

Rectox Copper Oxide Rectifiers. 12 p. (Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.)

Model 355 ¾ Yard Excavator. 8 p. (The Harnischfeger Corp., Milwaukee, Wis.)

Cummins Diesels. 8 p. (Cummins Engine Co., Columbus, Ind.)

New Holland Roll Crushers. 12 p. (New Holland Machine Co., New Holland, Pa.)

The Williams Hook-On Single Line Bucket. 6 p. (The Wellman Engineering Co., Cleveland, O.)

Low Head Horizontal Screens. 8 p. (Allis-Chalmers Mfg. Co., Milwaukee, Wis.)

Kropp Forged Steel Flange List No. 125. 24 p. (The Kropp Forge Co., Chicago, Ill.)

McIntosh & Seymour Corp., Auburn, N. Y., wholly-owned subsidiary of the American Locomotive Co., has been merged with the parent company and the business heretofore conducted by McIntosh & Seymour Corp. will be carried on by the Diesel Engine Division, American Locomotive Co.

The complete line of McIntosh & Seymour four-cycle Diesel engines will continue to be produced. There has recently been added the two-cycle Diesel designs of Sulzer Bros., of Winterthur, Switzerland, which are to be built and sold in America under the tradename "Alco-Sulzer."

The Equipment Reclamation Works has taken over the welding and hard-surfacing business formerly conducted by the McLean Welded Products Corp. at 530 W. 19th St., Chicago, Ill. The concern operates on a nationwide scale and does considerable work on the job such as welding and hard-surfacing excavating and crushing equipment. W. A. Owens, a welding expert for many years with the Lincoln Electric Co., is general manager.

The W. W. Sly Manufacturing Co., Cleveland, O., manufacturers of dust-control and other equipment, has appointed Alexander Haigh of 141 Milk St., Boston, Mass., as representative for the New England States. Mr. Haigh has been established in Boston for a good many years and is well known among industries of that section.

YOU CAN'T REPLACE A HEAD —BUT YOU CAN *PROTECT* ONE

McDonald Safety Hat not affected by weather. Permanently retains its exact size and shape.

Safety Hat of DURALUMIN Lessens Head Injuries

For the first time, Davis can offer complete head protection to men working even under the most hazardous conditions. Where a severe blow would puncture an ordinary, rigid hat, the new McDonald Safety Hat of tough, blow-resisting Duralumin metal withstands and cushions severe shocks.

You can save painful injuries as well as lives formerly lost. Minimize your compensation with this new safety helmet. Allow your men to work more confidently, skilfully, knowing that when they wear a McDonald Safety Hat they are completely protected.

Six distinct features of this new Safety Hat bearing on comfort, "wearability", etc., will interest you. Send now for a copy of the bulletin completely describing them. The coupon is for your convenience.

DAVIS PRODUCTS: First Aid Supplies (Tannoid for burns, Isodine—the newer antiseptic) . . . Gas Masks . . . Lineman's Safety Equipment . . . Gas Indicators . . . Protective Clothing . . . Goggles.

DAVIS EMERGENCY EQUIPMENT CO., INC.
Chicago, Ill. • New York City • Houston, Tex.
San Francisco and Los Angeles, Cal.

Davis Emergency Equipment Co., Inc.
55 Van Dam Street, New York City

Please send my copy of your Bulletin on McDonald Safety Hat to

Name_____

Address_____

City_____ P.Q.1

BUYERS' GUIDE

A Directory of Pit and Quarry Advertisers Indexed According to Product.

Although every effort is made to insure accuracy and completeness in these listings, the publisher cannot accept responsibility for errors or omissions. Any mistakes discovered will gladly be rectified.

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Gardner-Denver Co.
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*Sauerman Bros., Inc.
Wellman Engr. Co.
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Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
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*Jeffrey Mfg. Co.
*Link-Belt Co.
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*Robins Conveying Belt Co.
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*Koehring Co.
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*Link-Belt Co.
*Page Engr. Co.
*Sauerman Bros., Inc.
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*Link-Belt Co.
Wellman Engr. Co.
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*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
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*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.
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*Eagle Iron Works
*Hardinge Co.
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*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Link-Belt Co.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
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*Bartlett & Snow Co., C. O.
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Chain Drives
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*Link-Belt Co.
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*Bartlett & Snow Co., C. O.
Chain Belt Co.
Haiss Mfg. Co., Geo.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.
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*Bartlett & Snow Co., C. O.
Chain Belt Co.
Haiss Mfg. Co., Geo.
*Hendrick Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
*Robins Conveying Belt Co.
*Smidth & Co., F. L.
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*Deister Machine Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
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*Link-Belt Co.
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*Jeffrey Mfg. Co.
*Link-Belt Co.
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*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
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*Hardinge Co.
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*Raymond Bros. Impact Pulv. Co.
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*Jeffrey Mfg. Co.
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*Robins Conveying Belt Co.
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*Bay City Shovels, Inc.
*Bucyrus-Erie Co.
*Harnischfeger Corp.
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*Koehring Co.
*Lima Locomotive Works, Inc.
*Link-Belt Co.
Michigan Power Shovel Co.
Northwest Engr. Co.
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*Harnischfeger Corp.
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*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
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*Traylor Engr. & Mfg. Co.
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*Bartlett & Snow Co., C. O.
Crushers (Roll)
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Bonnot Co.

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BUYERS' GUIDE

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Manganese Steel Forge Co.

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*Sauerman Bros., Inc.
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*Link-Belt Co.
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Republic Rubber Co.

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*Robins Conveying Belt Co.
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*Smidth & Co., F. L.
*Traylor Engr. & Mfg. Co.

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*Hardinge Co.

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*Smidth & Co., F. L.

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*Bartlett & Snow Co., C. O.
*Fuller Co.
*Hardinge Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
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*Robins Conveying Belt Co.

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*Hardinge Co.

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*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.

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*Bartlett & Snow Co., C. O.
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*Fuller Co.
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*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

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*Cincinnati Rubber Mfg. Co.
Goodyear Tire & Rubber Co.
Hewitt Rubber Corp.
Republic Rubber Co.

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*Bartlett & Snow Co., C. O.
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*Hardinge Co.
*Jeffrey Mfg. Co.
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*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
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*Hardinge Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
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*Smidth & Co., F. L.
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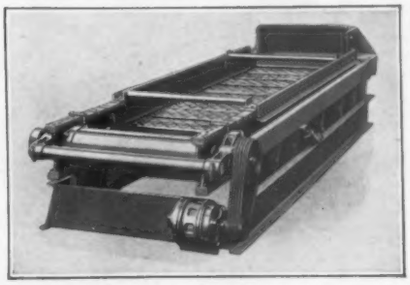

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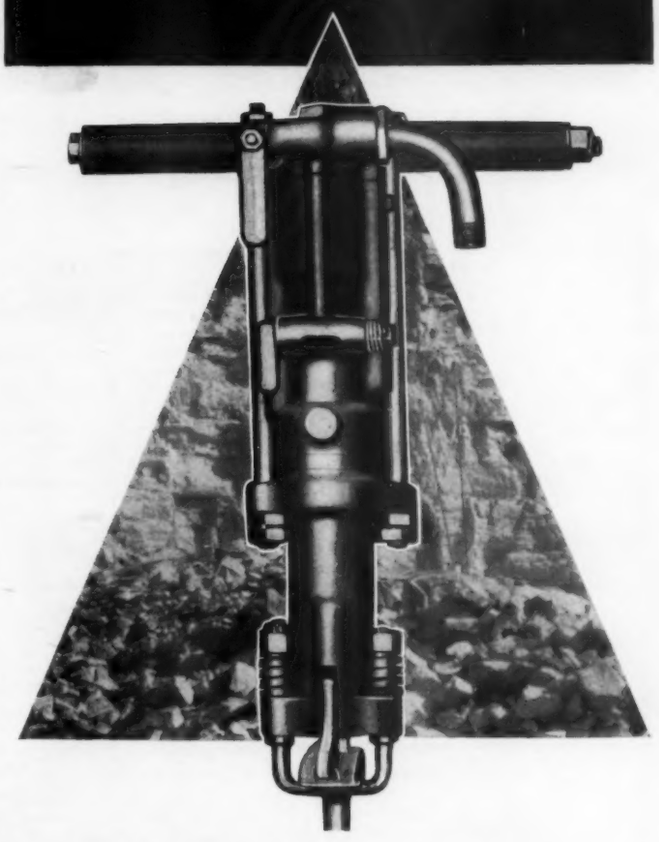

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BUYERS' GUIDE

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Rod Mills
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
*Traylor Engr. & Mfg. Co.

Rods (Welding)
American Manganese Steel Co.
Stulz-Sickles Co.

Rope (Wire) (See Wire Rope)

Safety Equipment
Davis Emergency Equip. Co.

Sand Separators
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
McLanahan and Stone Corp.
Simplicity Engr. Co.
Smith Engr. Works

Sand—Lime—Brick Machinery
*Hardinge Co.

Sand-Settling Tanks
*Bartlett & Snow Co., C. O.
Good Roads Machy. Corp.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Smith Engr. Works

Scrapers (Power Drag)
*Link-Belt Co.
*Sauerman Bros., Inc.

Screens
*Allis-Chalmers Mfg. Co.
American Manganese Steel Co.
Audubon Wire Cloth Corp.
Bacon, Inc., Earle C.
*Bartlett & Snow Co., C. O.
Buffalo Wire Works
Carnegie-Illinois Steel Corp.
Chain Belt Co.
Chicago Perforating Co.
Cleveland Wire Cloth & Mfg. Co.
*Deister Concentrator Co.
*Deister Machine Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
*Hardinge Co.
*Hendrick Mfg. Co.
Industrial Brownhoist Corp.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
Manganese Steel Forge Co.
McLanahan and Stone Corp.
Nordberg Mfg. Co.
*Productive Equip. Corp.
*Robins Conveying Belt Co.
Simplicity Engr. Co.
Smith Engr. Works
Sturtevant Mill Co.
Symons Bros. Development Co.
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Screens (Vibrating or Shaking)
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Buffalo Wire Works
*Deister Concentrator Co.
*Deister Machine Co.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Machinery Co.
*Link-Belt Co.
McLanahan and Stone Corp.
New Holland Machine Co.
Nordberg Mfg. Co.
*Productive Equip. Corp.
*Robins Conveying Belt Co.
Simplicity Engr. Co.
Smith Engr. Works
Sturtevant Mill Co.
Symons Bros. Development Co.
*Tyler Co., W. S.

Scrubbers
*Tyler Co., W. S.

Separators (Air) (See Air Separators)

Separators (Magnetic)
Exolon Co.

Separators, Slurry
*Smidth & Co., F. L.

Sheaves
*Allis-Chalmers Mfg. Co.
Chain Belt Co.
*Eagle Iron Works
*Gruendler Crusher & Pulverizer Co.
Haiss Mfg. Co., Geo.
Hetherington & Berner, Inc.
*Link-Belt Co.
*Jeffrey Mfg. Co.
McLanahan and Stone Corp.

Shovels (Electric, Internal-Combustion and Steam)
*Bay City Shovels, Inc.
*Bucyrus-Erie Co.
*Harnischfeger Corp.
Industrial Brownhoist Corp.
*Koehring Co.
*Lima Locomotive Wks., Inc.
*Link-Belt Co.
Michigan Power Shovel Co.
Northwest Engr. Co.

Silos
Chain Belt Co.
*Smidth & Co., F. L.

Skip Hoists and Skips
*Allis Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Chain Belt Co.
Hetherington & Berner, Inc.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Sleeves Dredge
*Cincinnati Rubber Mfg. Co.

Speed Reduction Units
Chain Belt Co.
*Link-Belt Co.

Spouts (See Chutes and Chute Liners)

Sprays
*Deister Concentrator Co.

Sprockets and Chain
*Bartlett & Snow Co., C. O.
Chain Belt Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Stackers
*Jeffrey Mfg. Co.

Steel (Alloy)
(See Alloys—Steel)

Steel Grating (See Grating, Steel)

Steel Plate Construction
Hetherington & Berner, Inc.
Manganese Steel Forge Co.

Stone Grapples
Owen Bucket Co.

Storage Equipment
*Bartlett & Snow Co., C. O.
Chain Belt Co.
Haiss Mfg. Co., Geo.
*Jeffrey Mfg. Co.
*Kern Co., Fred T.
*Link-Belt Co.
*Sauerman Bros., Inc.

Sweeping Systems
*Allen-Sherman-Hoff Co.

Tanks
*Bartlett & Snow Co., C. O.
*Hendrick Mfg. Co.
*Link-Belt Co.

Tanks (Sand-Settling)
*Bartlett & Snow Co., C. O.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Smith Engr. Works

Testing Sieves and Shakers
*Hendrick Mfg. Co.
*Tyler Co., N. S.

Thickeners (Slurry)
*Hardinge Co.

Tire Repair Materials
Goodyear Tire & Rubber Co.

Tools (Drill) (See Drilling Accessories)

Track Shifters
Nordberg Mfg. Co.

Tractors
*Allis-Chalmers Mfg. Co.

Transformers
*Allis-Chalmers Mfg. Co.

Transmission Belting (See Belting)

Transmission Machinery
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
Chain Belt Co.
*Gruendler Crusher & Pulverizer Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

Trippers
*Bartlett & Snow Co., C. O.
Chain Belt Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Truck Cranes (See Cranes)

Truck Mixers
*Bartlett & Snow Co., C. O.
Chain Belt Co.
Jaeger Machine Co.

Trucks and Trailers (See Motor Trucks)

Tube-Mills (See Mills — Ball, Tube, etc.)

Tubes (For Tire Casings)
Goodyear Tire & Rubber Co.

Underground Loaders
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.

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Chain Belt Co.
*Fuller Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.

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*Cincinnati Rubber Mfg. Co.
Taylor Forge & Pipe Works

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*Link-Belt Co.

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Chicago Perforating Co.
*Hendrick Mfg. Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
Manganese Steel Forge Co.

Vibrating Screens (See Screens—Vibrating)

Vibrators
*Jeffrey Mfg. Co.
*Tyler Co., W. S.

Wagons (Dump)
*Koehring Co.

Washers (Sand, Gravel and Stone)
*Allis-Chalmers Mfg. Co.
*Bartlett & Snow Co., C. O.
*Eagle Iron Works
Haiss Mfg. Co., Geo.
*Hardinge Co.
*Kennedy-Van Saun Mfg. and Eng. Corp.
Lewistown Foundry & Mach Co.
*Link-Belt Co.
McLanahan and Stone Corp
*Smidth & Co., F. L.
Smith Engr. Works
*Traylor Engr. & Mfg. Co.
*Tyler Co., W. S.

Welding and Cutting Equipment
Stulz Sickles Co.

Welding Supplies
*Harnischfeger Corp.
Manganese Steel Forge Co.
Stulz Sickles Co.

Well Drills (See Drills—Well)

Wheels (Car)
American Manganese Steel Co.
*Eagle Iron Works

Wheel Rims. See Rims—Wheel

Winches and Capstans
*Bartlett & Snow Co., C. O.
Chain Belt Co.
*Jeffrey Mfg. Co.
*Link-Belt Co.
*Robins Conveying Belt Co.

Wire Cloth
Audubon Wire Cloth Corp.
Buffalo Wire Works
Cleveland Wire Cloth & Mfg Co.
Manganese Steel Forge Co.
*Robins Conveying Belt Co.
Tyler Co., W. S.

Wire Rope
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Buffalo Wire Works
*Williamsport Wire Rope Co.

Wire Rope Fittings
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*Williamsport Wire Rope Co.

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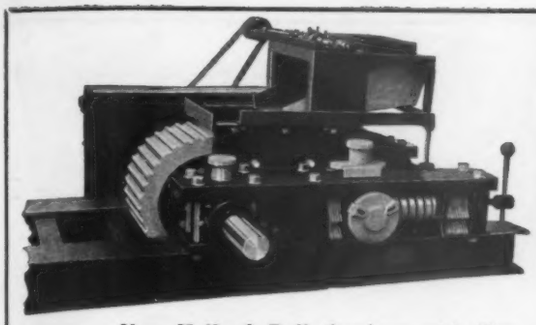
Manganese Steel Forge Co.

Worm Gears (See Gears and Pinions)

* See also information in the 1936 Pit and Quarry HANDBOOK.



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SCREENS

New Holland Roll Crushers with New Holland Pulsating Feeders double the roll capacity. Ribbed shells increase the angle of grip and make less dust. Built in a wide range of sizes.

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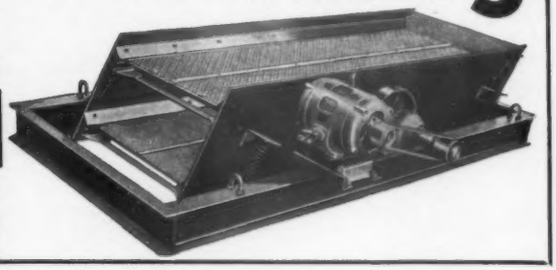

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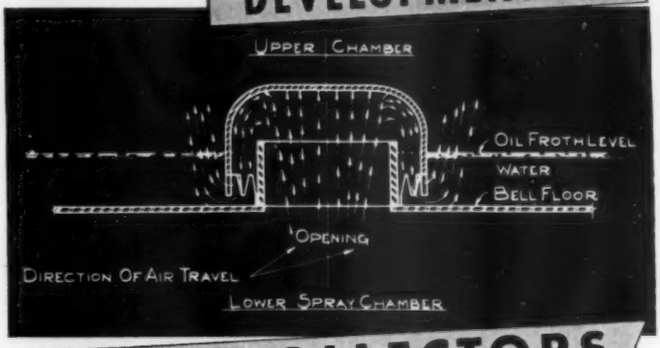

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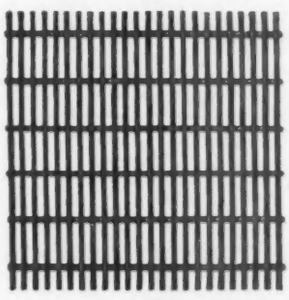

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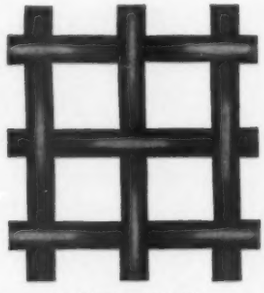

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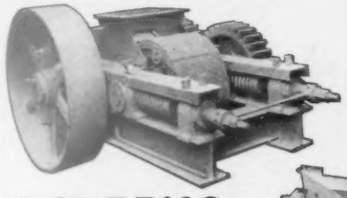

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Single and double roll and jaw crushers, hammer mills, super dry pans, — steel log washers and scrubbers, sand drags, revolving and vibrating screens, elevators, conveyors, dryers, jigs, hoists.

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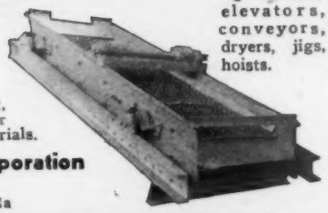
Complete portable, semi-portable and stationary crushing, screening and washing plants for different capacities of any materials.



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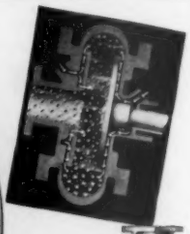

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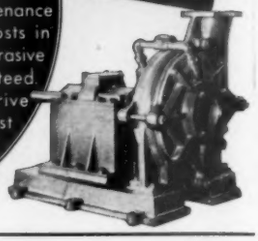

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Try HENDRICK Vibrating Screen Plate

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GIVES YOU A VIBRATING SCREEN WITH—

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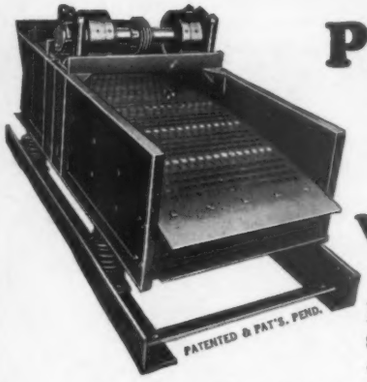

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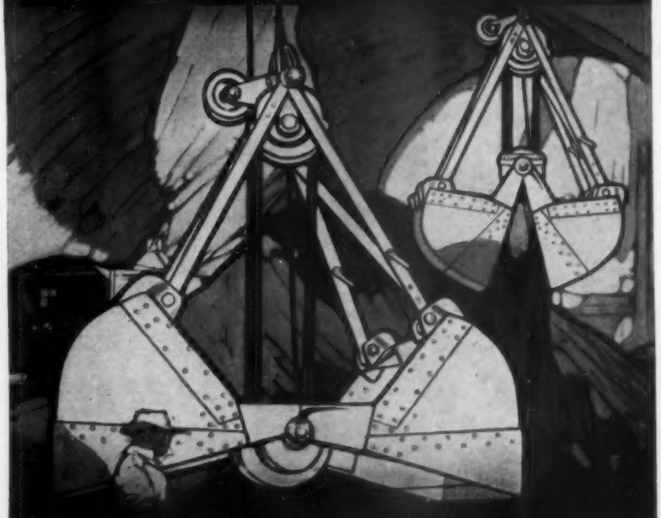

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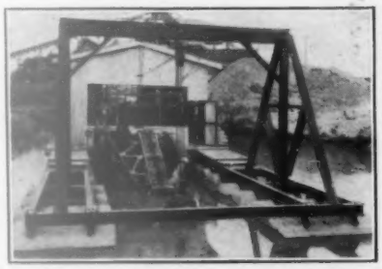
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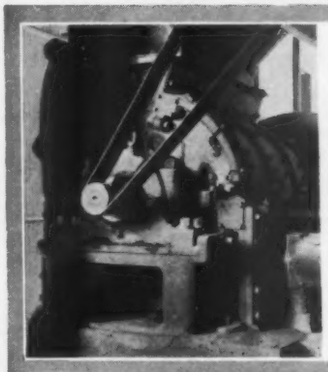

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Sauerman Cableways for wet pits and Sauerman Crescent Scrapers for dry pits and banks have no equals for economy.

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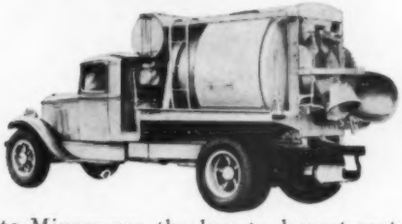
REX MOTO-MIXERS



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Aggregate Handling Systems Cement Elevators
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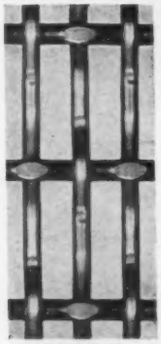

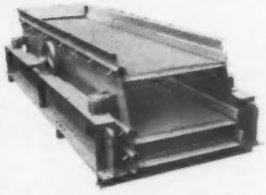

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In all Meshes and Metals

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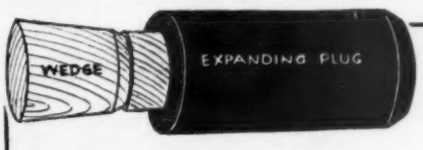

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600	G. E. Syn.	257
600	Al. Ch. Syn.	450
500	G. E. Syn.	1200
500	West. Syn.	720
450	West. Sl. Rg.	875/700
400	West. Syn.	720
400	West. Sl. Rg.	514
400	G. E. Sl. Rg.	885
300	Al. Ch. Sl. Rg.	585
250	G. E. Sl. Rg.	257
250	West. Sl. Rg.	700
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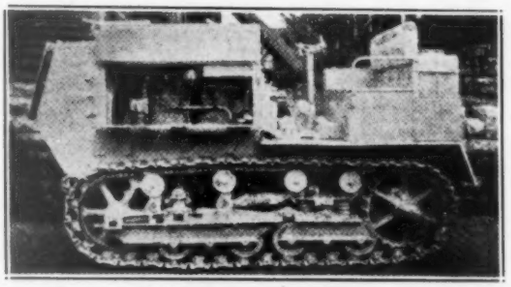

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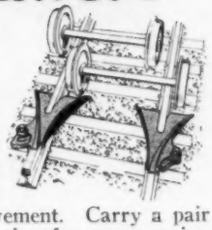

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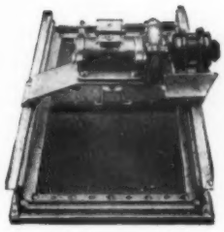

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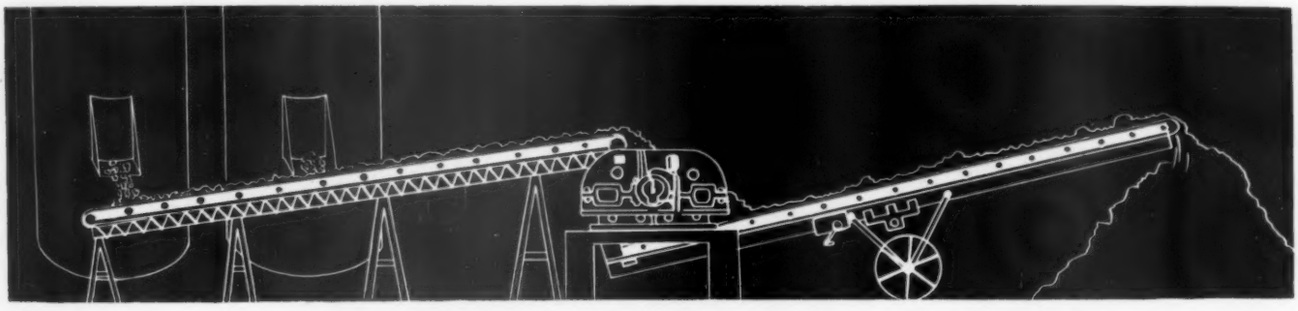
We also manufacture Sand Classifiers and the Deister Overstrom Diagonal Deck Washing Table for sand and gravel, which produces a premium product at minimum cost—handling from 18 to 40 tons per hour.

Write for Bulletins



Bonnot REDUCTION CRUSHER

Produces Stabilized Road Material in One Pass

The above sketch pictures the actual setup and arrangement as installed in Akron, Ohio. The feed from either bin is 2½" material and is reduced to 95% through ¾" without further screening or sizing. The gravel contains sufficient sand stone to provide the required percentage of fines.

This is an exceptionally tough crushing job because of fines and moisture. The Bonnot Reduction Crusher is handling this work very successfully, producing 20 tons per hour of ¾" with less than 10 HP.

With a Bonnot Crusher there is less maintenance; no rubbing or abrasive action to produce fines; less rejections; no oversize or slabs.

Let us show you what the efficient Bonnot Crusher can do for you. Full details are contained in Bulletin 160.

THE BONNOT COMPANY
CANTON, OHIO
New York Office, 30 Church Street

95%

OF ALL FIRST ORDERS FOR TRU-LAY *Preformed*

REPEAT!

At least 95 per cent of all those who buy TRU-LAY Rope for the first time on our recommendations come back for more. What better acknowledgment could there be of TRU-LAY's all-around superiority?

The reasons for this high percentage of repeat business are many. In the first place TRU-LAY Preformed is easier to handle. It resists kinking, requires no seizing. It is faster to splice and socket. It resists twisting in sheave or drum grooves. Broken crown wires refuse to wicker out to jab workmen's hands. Being completely free of all internal stress *it lasts much longer.* It is a perfect example of relaxation based on preformation.

Specify TRU-LAY Preformed for your next rope. Learn, on your own equipment and with your own men, the real dollar value of this *original* preformed rope.

AMERICAN CABLE COMPANY, Inc.

Wilkes-Barre, Pennsylvania

An Associate Company of the American Chain Company, Inc.

IN BUSINESS FOR YOUR SAFETY

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TRU-LAY *Preformed* Wire Rope

ALL AMERICAN CABLE COMPANY ROPES MADE OF IMPROVED PLOW STEEL ARE IDENTIFIED BY THE EMERALD STRAND